

STORM



SERVICE MANUAL

This manual includes:

- Information on troubleshooting
- Information on testing parts
 - Repair instructions

F392044
Edition 01.99

General information

This service manual contains all information necessary for maintenance and servicing of the STORM wheelchair.

- Maintenance and servicing work is to be carried out in accordance with this service manual.
- Comply with all safety instructions
- Information on operation , general maintenance and servicing can be found in the operating manual of STORM.
- Refer to the replacement parts catalog for information on ordering replacement parts.
- We reserve the right to make changes in the interests of technical progress.
- Maintenance and repair work on the STORM may only be performed by qualified personnel.
 - -Maintenance technicians should at least be trained in a relevant field, e.g. as two-wheeled vehicle or orthopaedics technicians, or have an equivalent amount of professional experience.
 - -Personnel should also be familiar with electrical measurement equipment (multimeters).
- Should you encounter difficulties or have any questions, please contact INVACARE-SERVICE:
- INVACARE can not be held liable for changes to the STORM resulting from maintenance and servicing work carried out incorrectly or not according to the relevant instructions.

Information concerning transportation

- If the wheelchair has to be sent away to the manufacturer for more serious repairs, always use the original packaging for transportation.
- Please include a detailed account of the fault.

You will find the following symbols in this repair manual:



NOTE:

This symbol indicates general information concerning special features and helpful advice for disassembly and assembly.



CAUTION:

*Please pay special attention to this symbol. It indicates
>Safety instructions<.*

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1.0 Safety and assembly instructions

The safety instructions are provided in the interests of working safety and must under all circumstances be complied with.

Prior to all inspection and repair work:

- Read this service manual and the appertaining User's Manual.
- Ensure that minimum qualifications for performing relevant work are fulfilled (see chapter entitled "General information").



CAUTION:

- *Note that some components are heavy. You should take this into account above all when removing the motors and/or the batteries.*
- *The power supply for the wheelchair must be switched off before any conductive parts are removed. Remove the batteries.*
- *When performing tests on conductive parts, ensure that the contacts are not short-circuited.*
> Danger of fire and injury from burns <
- *Only use tools which are in perfect working order and are not damaged.*

During disassembly and assembly:

- Mark the current settings of the wheelchair (seat, armrests, back etc.) and the combination of cable connections before carrying out disassembly work. This will make assembly easier afterwards.



CAUTION:

- *Support the raised wheelchair with suitable supports before you begin disassembly or re-assembly.*
- *Never use "normal" nuts instead of self-locking nuts.*
- *Always use correctly-sized washers or separators.*



NOTE:

- All plug connections are fitted with clips that prevent them from accidentally slipping apart when the wheelchair is in operation.
- To release connectors, the clips must be pressed in.
- When carrying out assembly work, make sure that the clips latch in securely.

Prior to initial use / after repair work:



CAUTION:

- *Check to make sure all screws are securely tightened.*
- *Check that all parts are properly locked in place.*
- *Make sure the tyre pressure is at the recommended 2.5 bar before driving the powerchair.*
- *Always perform a test-drive after repair work.*

2.0 List of tools

A standard toolkit comprising the following minimum inventory is required:

Combination ring and open-end spanner	SW 6, 7, 8, 10, 11, 12, 13, 17, 19
Allan key	2,5 mm, 3mm, 4mm, 5 mm, 6 mm, 8mm, 10mm
Torque wrench	(commercially available)
Socket spanner set	
Screwdrivers for slotted screws	(various)
Crosstip screwdriver	No.1, No.2 and No. 3
Side-cutting pliers	
Flat pliers	
Round pliers	
Pointed pliers	
Waterpump pliers	
Cable lug pliers	
Wooden or plastic hammer	
Tyre repair set	(commercially available)
Tyre gauge	
Removing tool for valves	
Ejecting tool for tyre bearing	
Multimeter with testing spikes and different cable clamps	
Jumper cable	
Soldering iron 30W	
Wheel-hub puller for front wheels	
Mounting pliers for starlock caps	(commercially available, Tigtemeyer)
Required for the adjustments at the ACS control:	
Programming device item No. 6 001 450	
Software package, incl. interface cable and Dongle item No. P10 076	

3.0 Arrangement of Subassemblies, Components and Operational Controls

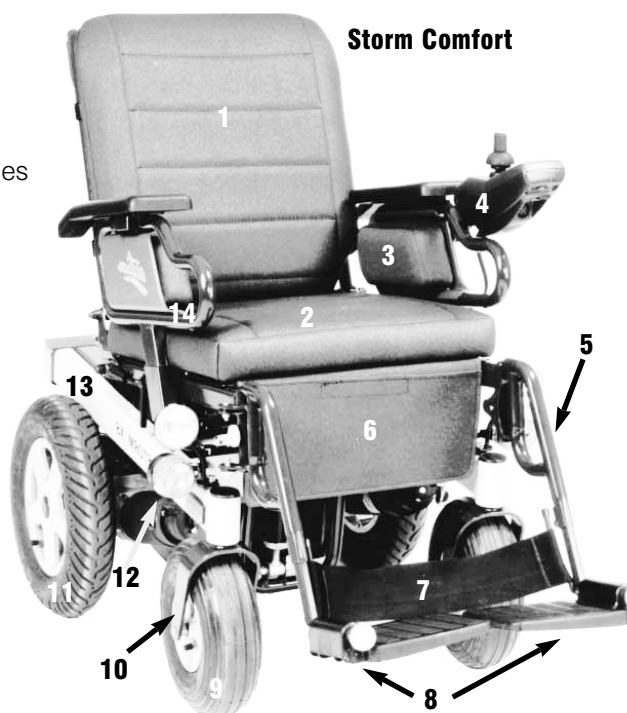
The following illustrations depict the general arrangement of the wheelchair's subassemblies, components and operational controls. The designations correspond to the designations of the components listed in the spare-parts catalogue.

Basically, the STORM is available as models Standard, Comfort and Recaro, each one consisting of the following main subassemblies.:

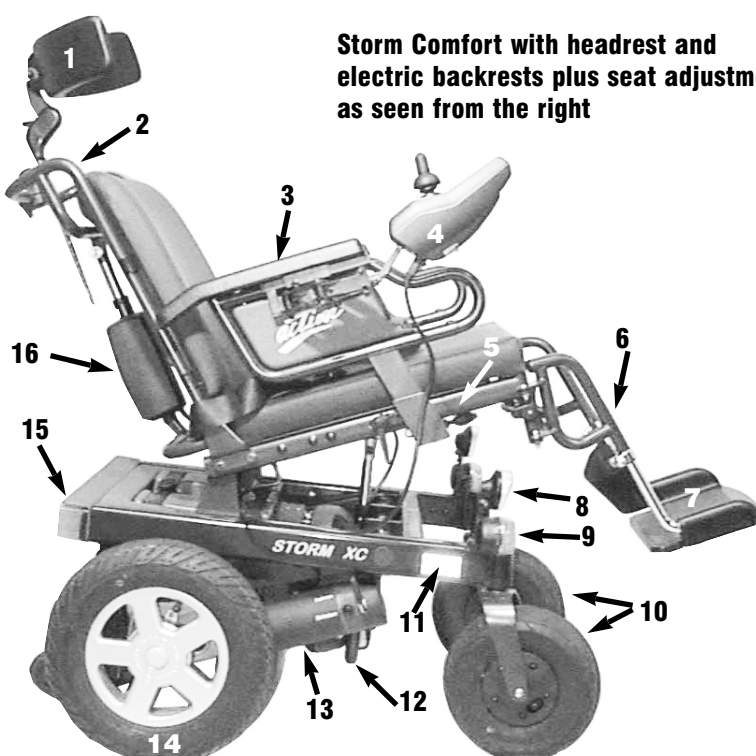
- Chassis
- Seating system
- Electric power supply
- Driving electronics
- Lighting installation

Depending on the wheelchair model, the main sub-assemblies are equipped with different subassemblies (legrests, operational controls, modules etc.).

- 1 Backrest padding
- 2 Seat cushion
- 3 Side padding
- 4 Standard joystick box
- 5 Legrest, complete
- 6 Apron with pocket
- 7 Calfbelt
- 8 Footplates
- 9 Front wheel, complete
- 10 Front-wheel fork
- 11 Rear wheel, complete
- 12 Flasher and headlight
- 13 Chassis
- 14 Side part, complete, right



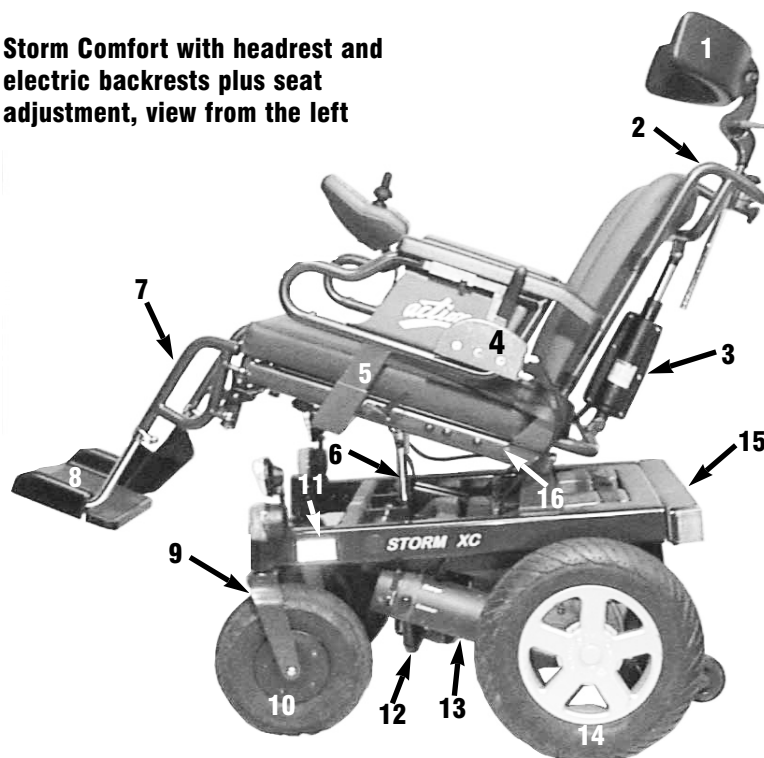
Storm Comfort with headrest and electric backrests plus seat adjustment, as seen from the right



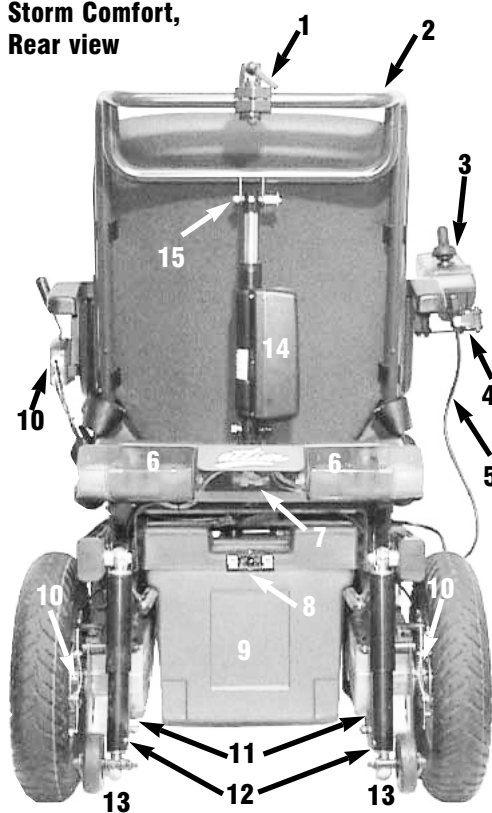
- 1 Headrest, complete
- 2 Backframe tube
- 3 Side part, complete
- 4 Standard joystick box
- 5 Seat frame
- 6 Legrest, complete, right
- 7 Footboard, one piece
- 8 Headlight
- 9 Flasher, front
- 10 Front wheels, complete
- 11 Reflector
- 12 Disengaging lever
- 13 Drive motor, right
- 14 Rear wheel, complete
- 15 Rear light assembly bar
- 16 Actuator for backrest

- 1 Headrest, complete
- 2 Back frame tube
- 3 Actuator for backrest
- 4 Brake lever for parking brake
- 5 Side part, complete
- 6 Actuator for seat
- 7 Legrest, complete
- 8 Footboard, one piece
- 9 Front-wheel fork
- 10 Front wheels, complete
- 11 Reflector
- 12 Disengaging lever
- 13 Drive motor, left
- 14 Rear wheel, complete
- 15 Rear-light assembly bar
- 16 Seat frame

Storm Comfort with headrest and electric backrests plus seat adjustment, view from the left

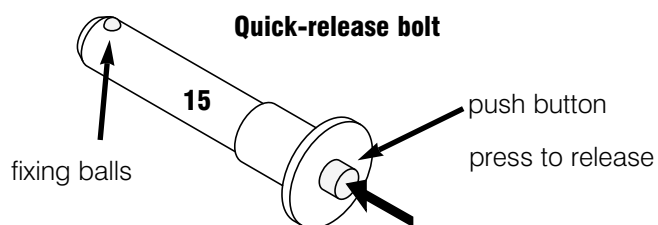


Storm Comfort, Rear view



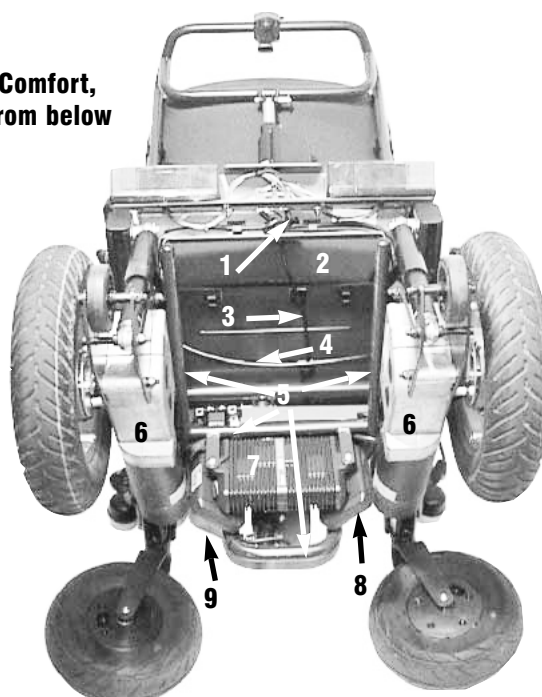
- 1 Headrest holder
- 2 Back-frame tubing
- 3 Standard joystick box
- 4 Mounting kit for joystick box, swiveling
- 5 BUS cable for joystick box
- 6 Rear lights, complete
- 7 Cable harness for light assembly bar, complete
- 8 Connection socket for cable harness (battery box)
- 9 Battery box, complete (inside)
- 10 Parking brake, complete
- 11 Gear for driving units
- 12 Shock absorber
- 13 Support wheels
- 14 Actuator for backrest
- 15 Quick-release bolt

Quick-release bolt

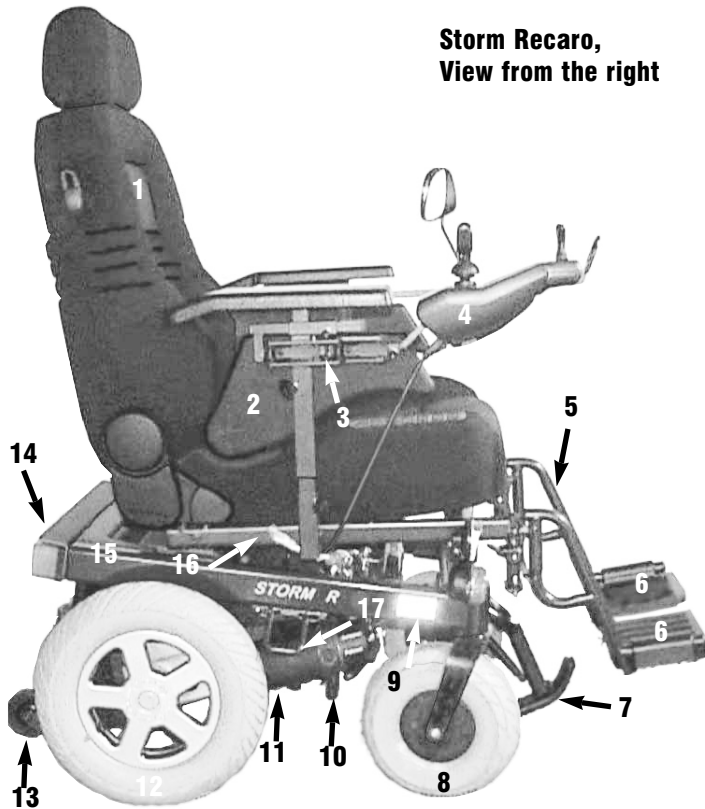


- 1 Cable harness for rear-light board
- 2 Seat plate
- 3 Cable for actuator (backrest adjustment)
- 4 Bowden wire for parking brake
- 5 Battery-box holder (tube frame, welded)
- 6 Driving units, complete
- 7 Main module for driving electronics
- 8 Lighting and adjustment module 24 V
- 9 Lighting module 12 V

Storm Comfort, View from below

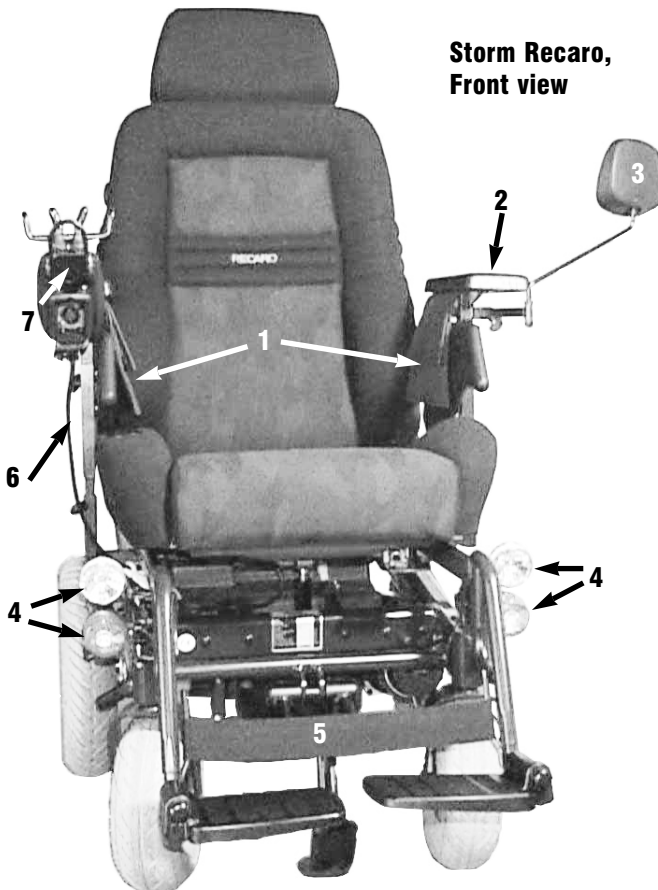


**Storm Recaro,
View from the right**



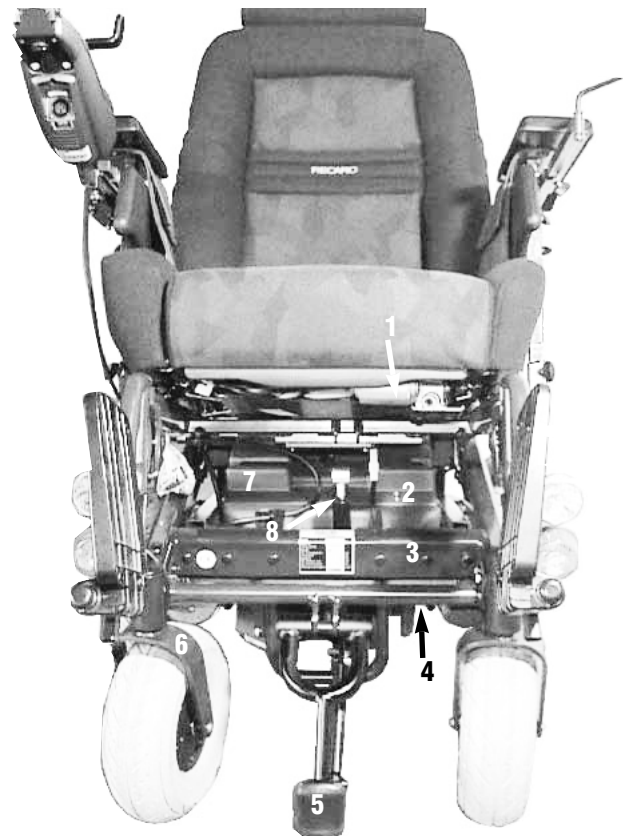
- 1 Recaro seat, complete
- 2 Side part, complete
- 3 Mounting kit for joystick box, swiveling
- 4 Special joystick box
- 5 Legrests, complete
- 6 Foot plates
- 7 Kerbstone lifter, complete
- 8 Front wheel, complete
- 9 Reflector
- 10 Declutching lever
- 11 Driving motor, right
- 12 Rear wheel, complete
- 13 Support wheel
- 14 Rear-light assembly bar, complete
- 15 Chassis
- 16 Seat frame
- 17 Taxi bracket

**Storm Recaro,
Front view**



- 1 Pocket for side part, Recaro
- 2 Side part, complete
- 3 Mirror for Recaro, complete
- 4 Headlight and flasher
- 5 Calf belt
- 6 BUS-cable for joystick box
- 7 Protection for joystick box

**Storm Recaro,
Seat tilted**



- 1 Actuator at Recaro seat
- 2 Splash protection for module
- 3 Chassis
- 4 Support bar for kerbstone-lifter fork
- 5 Kerbstone lifter
- 6 Front-wheel fork
- 7 Seat support for Recaro
- 8 Seat-angle adjustment, manual

4.0 Components of the Electronic Control (ACS)

4.1 General

The wheelchair's electronic control (Action Control System = ACS) consists of individual components (modules). According to each type of wheelchair, the wheelchairs are equipped with different modules.

ACS Modules:

Designation of Module	Designation on the Module Label
Main module	Power Module
Lighting module 24 V	Lighting Module 24 V
Lighting module 12 V (TÜV-Version)	Lighting Module 12 V
Lighting / actuator module	Combined Lighting + Actuator Module
Standard joystick box	DX - REM 24 / DX - REM 24 AS
Joystick box for attendant	DX - ACU 1AS / DX - REM 24 S
Control unit for actuators	DX - ARC 5
Joystick box for table or centre control	DX - REM 41 / REM 41 S
Chin control	
Voltage transformer for RECARO seat	DX - ACC 1 or. DC - DC Converter

Apart from the controlling functions, the electronic control has the following additional functions:

- Monitoring of the modules
- Monitoring of the driving system
- Monitoring of the actuator motors
- Error check



NOTE:

The control unit for the Recaro seat's adjustment functions is integrated into the seat and is not part of the ACS.

4.2 Connection Cables of the Modules

The connection cables of the modules are designated as BUS cables. The cables are arranged as four-conductor cables. Two of the conductors serve the power supply and two serve the transfer of data.

Grouping of Cables:

- Power supply = black earth cable
red positive cable
- Data transfer = yellow cable (CAN high)
violet cable (CAN low)

Main Module



Lighting Module



Standard Joystick Box



**Control Unit
Actuator Modules**



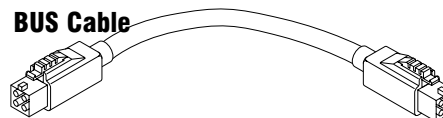
**Table / Central
Control**



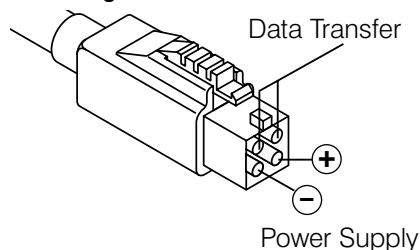
Chin Control



BUS Cable



BUS Plug



4.3 Status Displays (Error Displays)

Status displays are LEDs which by blinking point to errors in the wheelchair's electric system.

The following joystick boxes have a status display:

- Standard joystick box
- Chin control
- Table and central control

Die ON / OFF LEDs of these joystick boxes are arranged as status displays. The causes of the errors are displayed by a flashing interval (flashing code) of these LEDs.

The remaining modules are also equipped with status displays. A flashing of these displays calls the attention to an error in the module.



NOTE:

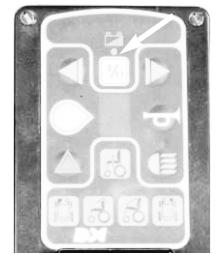
The ACS is equipped with an error memory, which can be evaluated by means of a commercially available PC. The additionally required hard and software can be ordered from INVACARE Deutschland GmbH under Part No.: **P10 076**.

Status Displays of the Joystick Boxes

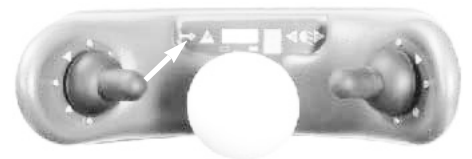
Standard Joystick Box



Table and Central Control



Chin Control



4.4 Microswitch

The microswitch is only mounted in connection with lighting module 12 V (TÜV version). The switch is attached to the rear light assembly bar. It switches the wheelchair off as soon as the rear light assembly bar is opened, thus preventing that the wheelchair is driven with a rear light assembly bar that is not correctly closed.

Mikroswitch



Installing position of the microswitch.



5.0 Modules

The equipment with modules depends on the type of wheelchair.

The basic equipment consists of the main module with its respective joystick box.

For a joystick box, any model can be used that is no older than the original joystick box. INVACARE joystick boxes are backward but not forward compatible.

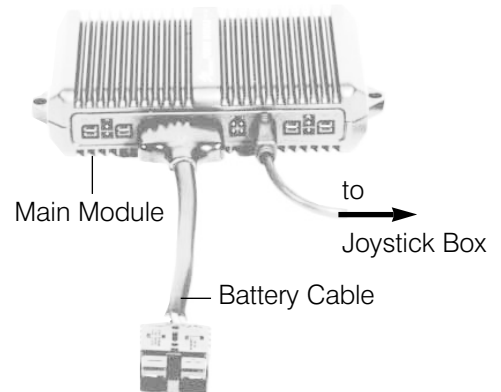
Modules for the wheelchair lighting or for the actuators for the adjustment of the seat and legrest angles can be installed additionally.

5.1 Wheelchair Equipment: without lighting, without actuators

Modules : • Main module (power module)
• Joystick Box

Cables : • BUS cable to joystick box
• Battery cable

Module and Cable Equipment

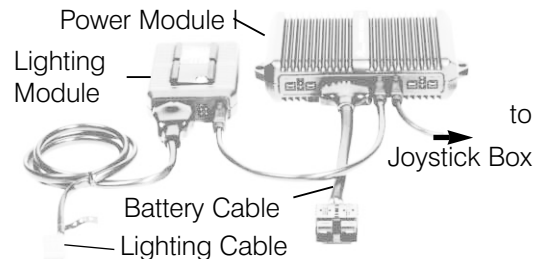


5.2 Wheelchair Equipment: with lighting 24 V, without actuators

Modules: • Main module (power module)
• Lighting module 24 V (Lighting 24 V)
• Joystick box

Cables : • BUS cable to joystick box
• BUS cable from main module to lighting module
• Battery cable
• Lighting cable

Module and Cable Equipment

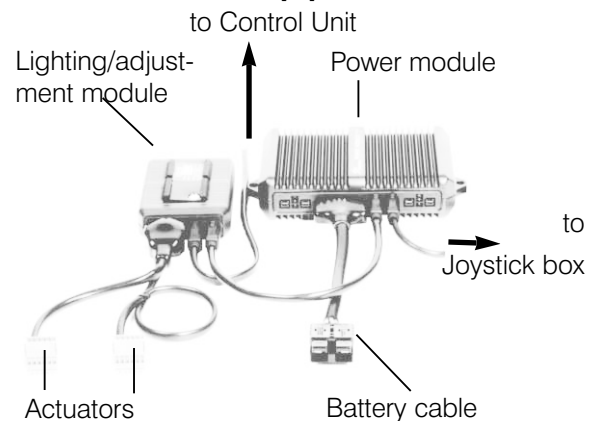


5.3 Wheelchair Equipment: without lighting, with actuators

Modules: • Main module (power module)
• Lighting- / adjustment module (Combined lighting + actuator module)
• Joystick box
• Control unit for actuators (In older joystick boxes, the actuators cannot be controlled via the joystick box.)

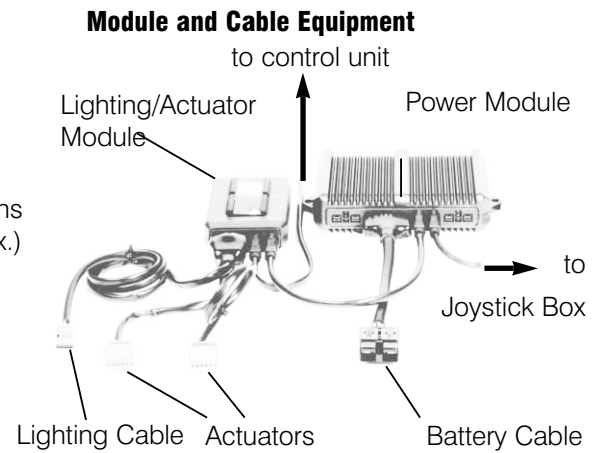
Cables: • BUS cable to joystick box
• BUS cable from the main module to the lighting / actuator module
• Battery cable
• Cable to actuators
• Cable to control unit for actuators (Only, if control unit is available.)

Module and Cable Equipment



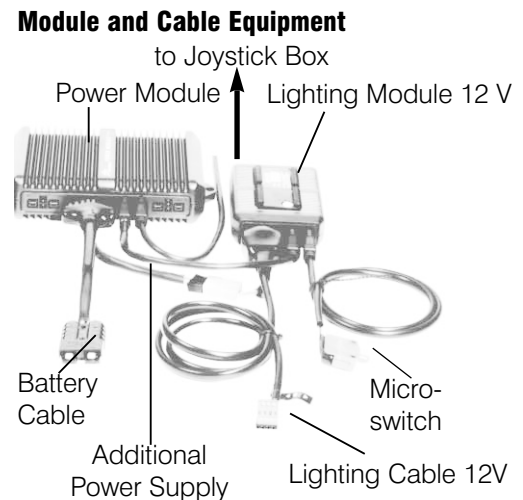
5.4 Wheelchair Equipment : with Lighting 24 V, with Actuators

Modules	• Main module (Power Module) • Lighting / Adjustment module (Combined lighting + actuator module) • Joystick box • Control of actuators (With older joystick boxes adjustment options cannot be controlled via the joystick box.)
Cables	• BUS cable to joystick box • BUS cable from power module to lighting / actuator module • Battery cable • Cable to actuator motors/lighting cable (In rare instances, two separate cables) • Cable to control unit for actuators (Only, if control unit is available)



5.5 Wheelchair Equipment: with Lighting 12 V (TÜV version), without actuator Motors

Modules:	• Main module (power module) • Lighting module 12 V • Joystick box • Microswitch
Cables:	• BUS cable to joystick box • BUS cable from power module to lighting module • Battery cable • Cable to microswitch • Cable for additional power supply • Lighting cable 12 V

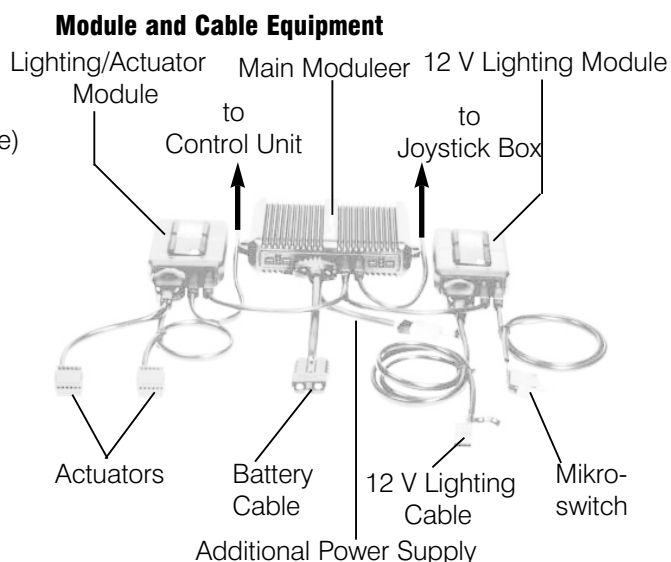


Additional Power Supply:

Serves to keep up the power supply of the lighting module 12 V via the ACS BUS cable in case of power failure, thus ensuring full service of lighting system and warning flashers.

5.6 Wheelchair Equipment: with 12 V Lighting (TÜV version), with Actuators

- Modules:
- Main module (power module)
 - Lighting / actuator module (combined lighting + actuator module)
 - 12 V lighting module
 - Joystick box
 - Control unit for actuators (in older joystick boxes, adjustment options cannot be controlled via the joystick box)
 - Microswitch
- Cables:
- BUS cable to joystick box
 - BUS cable from power module to lighting/actuator module
 - BUS cable to lighting module
 - Battery cable
 - Cable to microswitch
 - Cable for additional power supply
 - 12V lighting cable
 - Cable for actuators



Additional Power Supply:

Serves to keep up the power supply of the lighting module 12 V via the ACS BUS cable in case of power failure, thus ensuring full service of lighting system and warning flashers.

5.7 Wheelchair Equipment: with electrically adjustable RECARO Seat

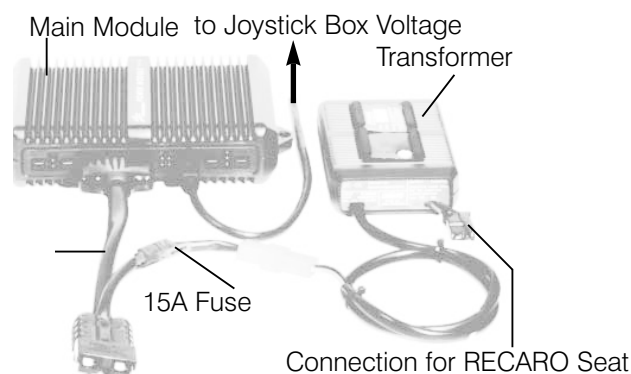
The basic equipment of the RECARO seat consists of the following components:

- Modules:
- Main module (power module)
 - Voltage transformer
 - Joystick box
- Cables:
- BUS cable to joystick box
 - Battery cable
 - Power supply cable for voltage transformer with 15 A fuse

The voltage transformer serves the power supply of the RECARO seat.

Depending on the type of wheelchair, the further equipment can be added according to chapters 5.2 to 5.3.

Module and Cable Equipment



6.0 Inspection Plan

Assembly	Check	Remedy	Chapter	✓
Headrest	• Headrest shell and padding • Headrest holder and fastenings	> Replace in case of damage > Tighten screws, Replace parts	9.1	
Armrests and Side Parts	• Damage and fastening of armrests • Damage and screwing of side parts • Mirror	> Tighten screws, replace pad > Tighten screws, Replace side parts > Replace	9.2	
Standard and Comfort Seat Seat, Seat Surface and Seat Plate	• Damage, screwings and seams • Check quick-release bolt	> Tighten screws, Replace parts > Replace	9.12	
Standard and Comfort Seat Backrest with Safety Belt	• Adjustment function • Damage, screwings and seams • Belt and buckle • Check quick-release bolt	> Adjust or replace Bowden wire, compression spring > Tighten screws, Replace parts > Replace > Replace	9.9 9.10 9.11	
Actuators	• Check damage and function	> Replace motors > Tighten screws	14.0	
Recaro Seat	• Check damage and function	> Replace seat if necessary	10.0	
Chassis with Battery Retainer Rear Wheel Links, and Kerbstone Lifter	• Check screwings, weld seams, splash guard of modules, reflectors etc.	> Tighten screws, replace parts	11.5 11.7 11.8	
Wheel Suspension and Wheels	• Function and damage of shock-absorbers • Check rear wheels for secure seat and wobble • Check front wheels for free running and wobble • Bearing of front wheel forks • Check tyres • Support castors with support plates	> Replace > Adjust, replace wheel hub > Adjust or replace axle bolt / wheel hub > Adjust / replace > Remount > Adjust or replace	11.1 to 11.5	

Assembly	Check	Remedy	Chapter	✓
Parking Brake	• Function • Bowden wires loose, Bowden wire covering damaged • Wear, damage of brake drums and brake linings	> Adjust, replace > Tighten, adjust, replace > Replace	14.4	
Drive Units	• Check functions for driving and pushing operation • Check motors • In models with clutch mechanism, check > check mechanism	> Replace gear or motor if necessary > Replace carbon brushes or motor > Tighten screws, nuts and replace parts, if necessary	11.6 13.0	
Legrests	• Weld seams, locks, screwings etc. • Check footplates • Actuators (if necessary)	> Tighten, replace > Tighten, replace > Replace	9.3 to 9.8	
Batteries	• Damage of batteries and boxes, corrosion on contacts • Check contacts, terminals • Check battery voltage	> Clean contacts, replace batteries or boxes > Tighten, replace > Charge batteries , replace	12.0	
Driving Electronics Joystick Boxes	• Joystick boxes, status display flashing • Fastening • Cable, plug connection • Function of joystick • Power supply	> Evaluate flashing codes > Tighten, replace > Replace > Replace joystick box > Replace cable, plug or joystick box	16.2 17.1 to 17.5	
Driving Electronics Main Module	• Status display flashing • Power supply	> Replace module > Replace cable, plug or module	16.3 17.6	
Lighting / Adjustment Modules	• Functions of lighting and adjustment modules • Power supply	> Check status displays on modules > Replace cable, plug or module	16.4 to 16.7 17.7 17.8	
Lighting System	• Damage of lights • Function of lamps	> Replace lights > Replace lamps	15.0	

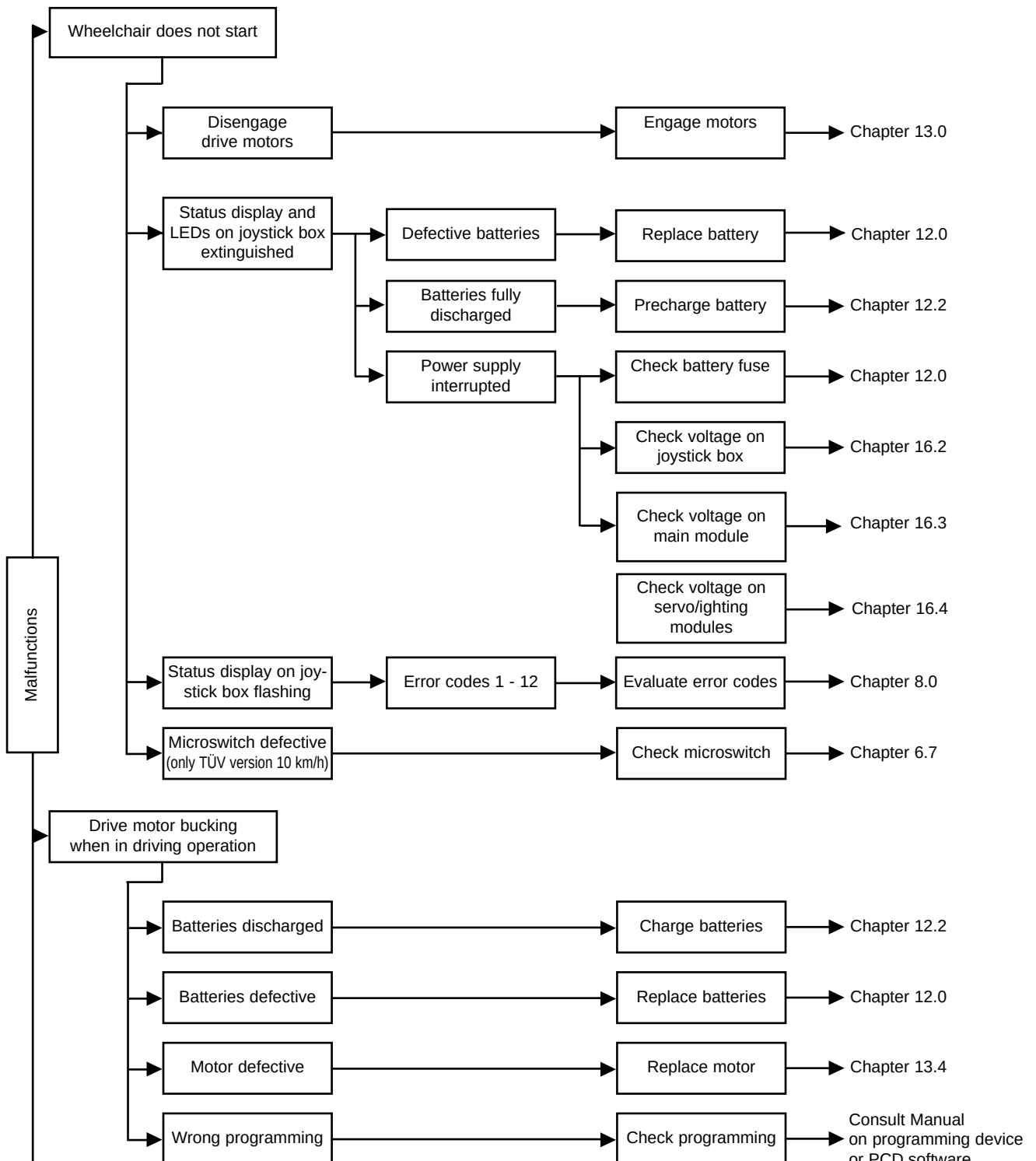
7.0 Operation Troubles

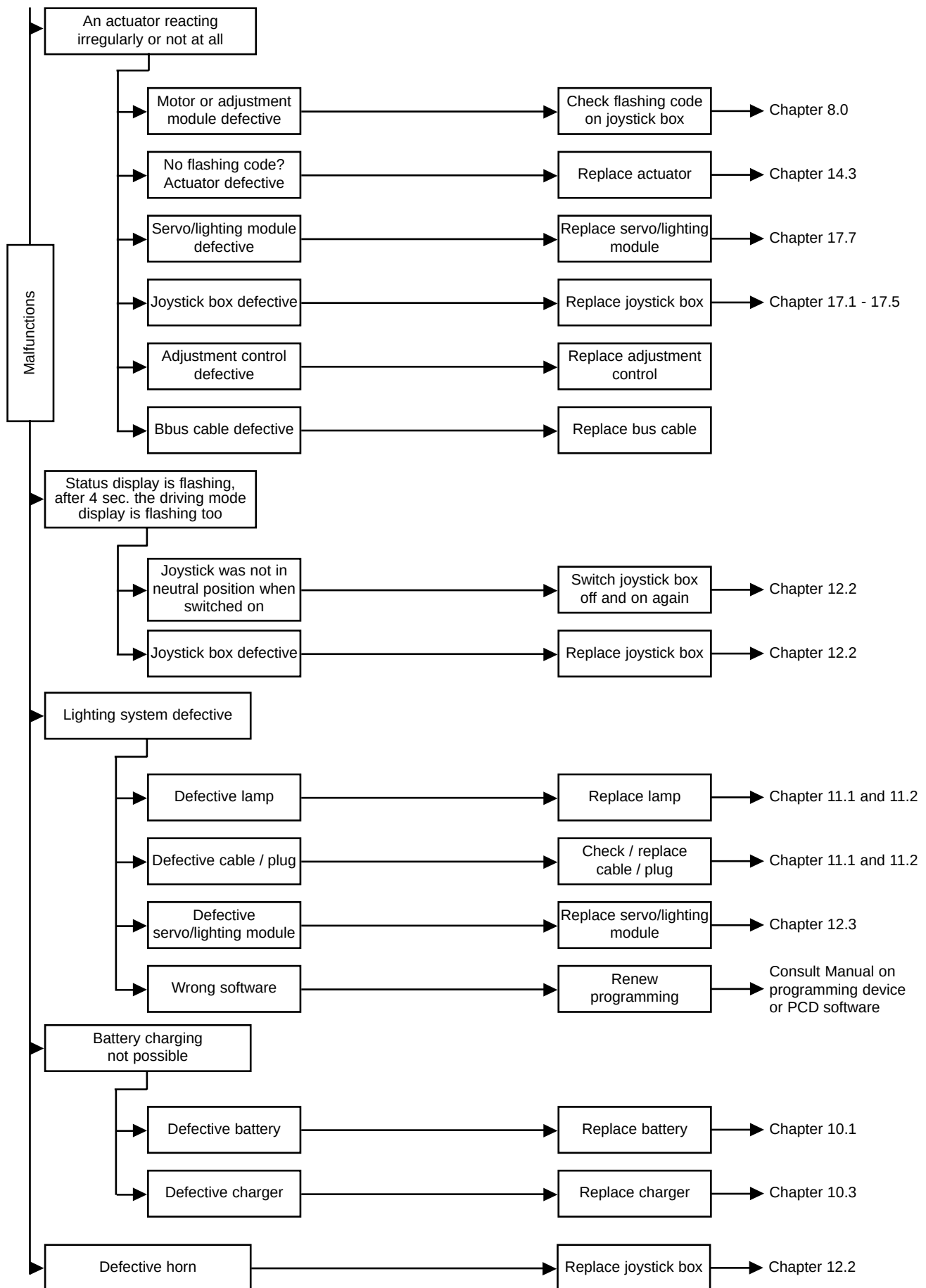
7.1 General Note

In case of malfunctions of the lighting system, actuators or power supply, proceed as follows:

- First evaluate the causes of malfunction specified in chapter 7.2.
- Check status display on joystick box and evaluate the error codes according to chapter 8.1, if necessary.
- Perform the necessary testings / repairs. Observe the cross references to the respective chapters in the manual or to the respective documentation.

7.2 Troubleshooting





8.0 Error Messages on Joystick Box

8.1 Error Codes of Joystick Box

The error codes specified as follows refer to the different STORM versions.
Perform the following test before evaluating error codes:

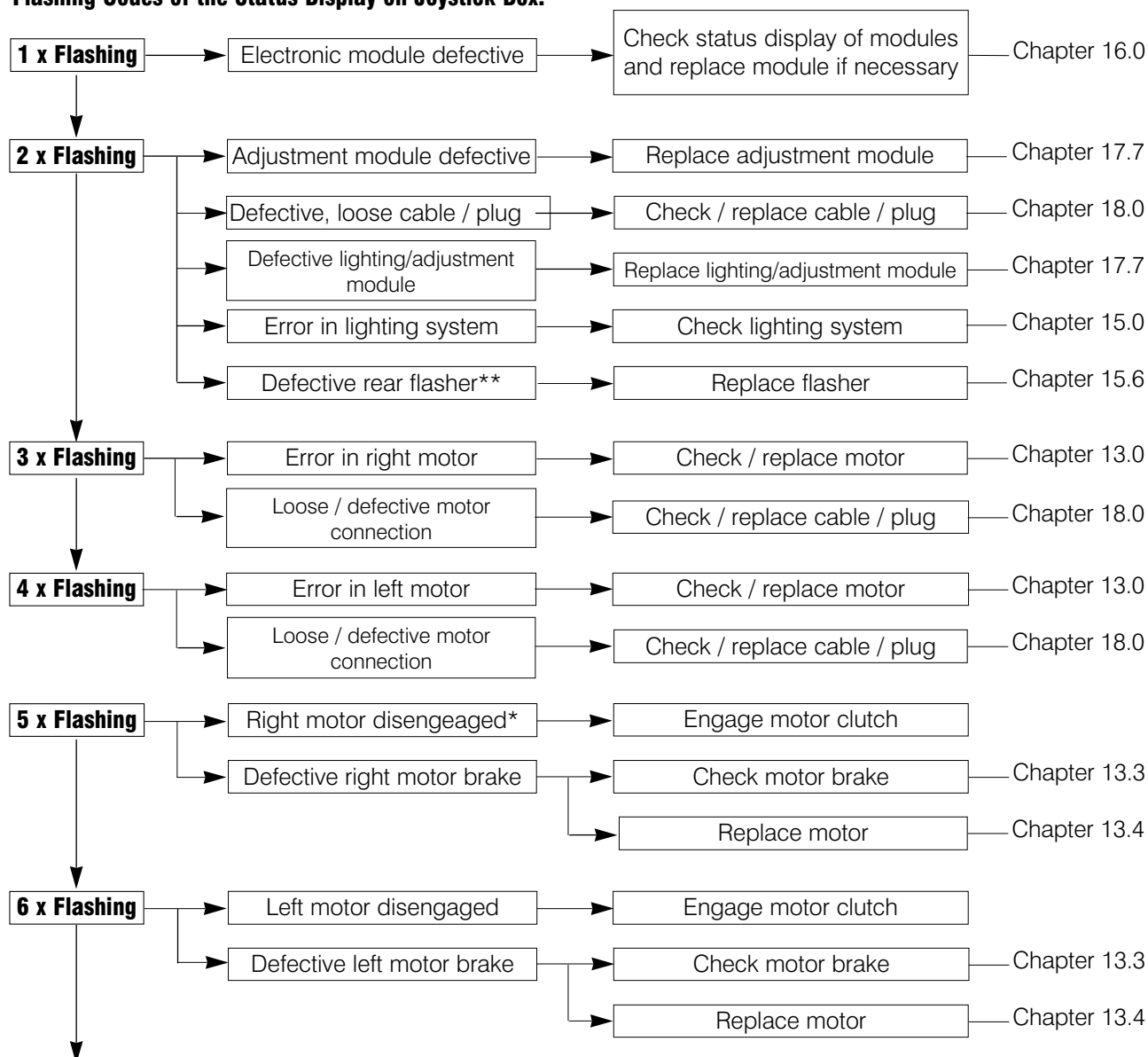
- Switch joystick box repeatedly off and on again. Wait approx. 5 seconds each time before switching on again.

The test examines whether the error can be eliminated by the electronics itself and might deactivate the flashing of the status display on the joystick box.

Should this not be the case, pinpoint the errors by means of the flashing codes as follows:

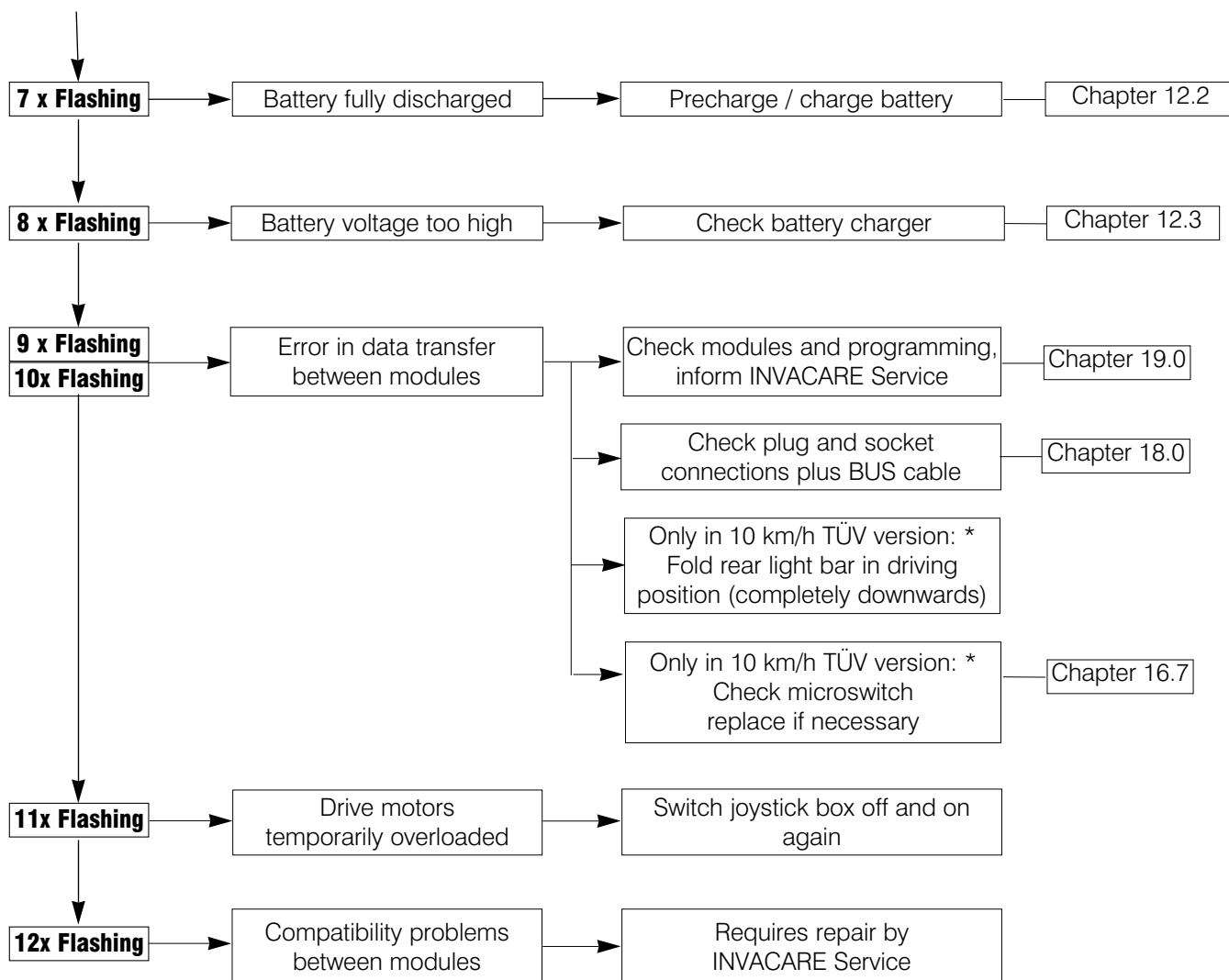
- Switch joystick box off and on again.
- Determine flashing code by counting.
- Wait for flashing pause (approx. 2 - 3 seconds).
- Count code sequence again.

Flashing Codes of the Status Display on Joystick Box:



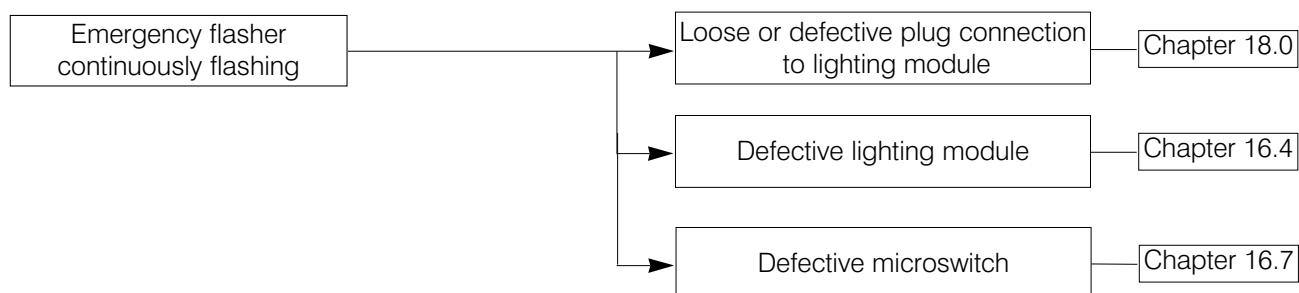
* The flashing code is also activated when both motors are disengaged.

** The flashing code is only activated when the flasher is switched on, too.



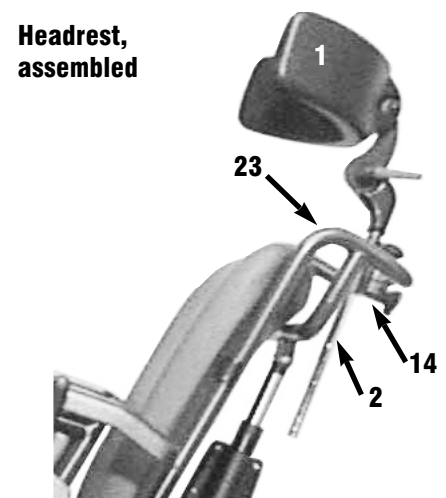
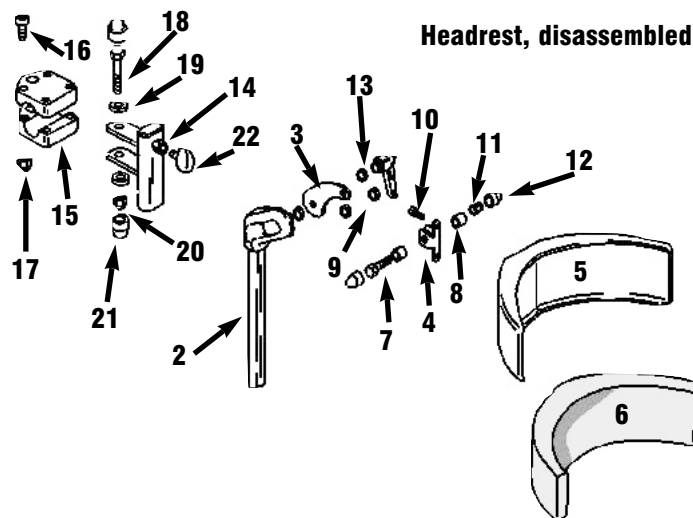
* When the joystick box has just been switched on, the driving mode and the status display will flash additionally.

Error Message 10 km/h version only



9.0 Testing and Repair Work on the Standard Seat System

9.1 Headrest



- | | | |
|--------------------------------------|----------------------------|-----------------------------|
| 1 Headrest, complete | 2 Headrest support | 3 Headrest arm |
| 4 Headrest arm bracket | 5 Headrest shell | 6 Headrest pad |
| 7 Hexagon head screw M8x50 | 8 2x Bushing 8,5x13 | 9 2x Washer 8,5 |
| 10 2x Slotted head screw M4x15 | 11 Nut M8, self-locking | 12 2x Protecting caps |
| 13 Clamping lever M6 with washer 6,5 | 14 Headrest holder | 15 Clamp |
| 16 4x Allen screw M5x25 | 17 4x Nut M5, self-locking | 18 Hexagon head screw M8x55 |
| 19 2x Washer 8,5 | 20 Nut M8, self-locking | 21 2x Protecting cap |
| 22 Clamping lever M5x10 | 23 Backrest-frame-tube | |

Inspection

- Headrest pad damaged?
- Headrest shell damaged?
- Clamping lever damaged?
- Individual parts damaged?
- Screwings loose?

Remedy

- > Replace pad.
- > Replace headrest shell.
- > Replace clamping lever.
- > Replace parts.
- > Tighten screwings.

Complete Disassembly

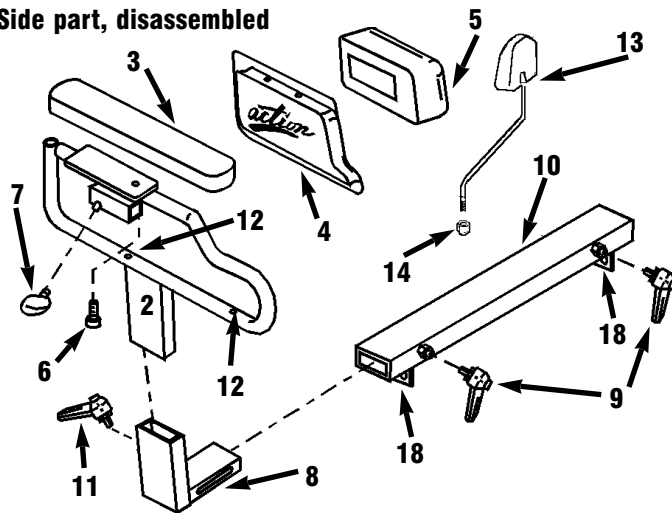
- Unscrew clamping lever (22) and remove headrest (1) with headrest support (2) from headrest holder (14)
- Remove headrest pad (6) from headrest shell (5) (Velcro fastener).
- Unscrew clamping lever with washer (13) completely and separate headrest shell (5) with headrest arm (3) from headrest support (2).
- Detach protecting caps (12) and separate nut (11) from screw (7).
- Detach screw (7) with bushings (8) and washers (9) plus headrest arm (3) from headrest shell (5).
- Loosen slotted head screw (10) and remove headrest arm bracket (4) from headrest shell (5)
- Take off protecting caps (21), detach nut (20) from screw (18) and remove screw with washers (19).
- Detach headrest holder (14) from clamp (15).
- Loosen Allen screws (16) and nuts (17) and detach clamp (15) from back frame tube (23).

Assembly

- The assembly is performed in the reverse order.

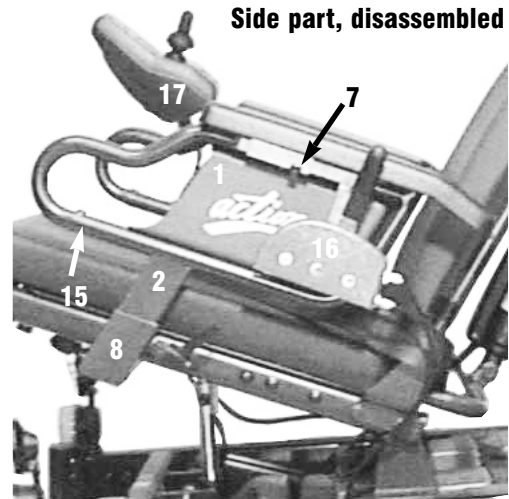
9.2 Armrests and Side Parts

Side part, disassembled



- | | |
|--|-------------------------------|
| 1 Side part, complete | 2 Side frame |
| 4 Side panel | 5 Side pads |
| 7 Wing or Allen screw M5 | 8 Side part holder |
| 10 Crossbeam, (part of the seat frame) | 11 Clamping lever M8x60 |
| 13 Rearview mirror | 14 Nut M8 with protecting cap |
| 16 Parking brake | 17 Standard joystick box |

Side part, disassembled



- | |
|---|
| 3 Armrest pad |
| 6 Hexagonal screw M4x35 |
| 9 Clamping lever M8x60 |
| 12 2x Bore hole for compression rivets |
| 15 Bore hole for mirror |
| 18 Hexagonal screws M5x20 with washers (not shown) 4x |

Inspection

- Armrest padding damaged?
- Screws of armrest loose?
- Side part padding damaged?
- Side part covering damaged?
- Side part frame damaged?
- Side part holder damaged?
- Clamping lever damaged?
- Mirror damaged?

Remedy

- > Replace armrest padding.
- > Tighten screws.
- > Replace side part padding.
- > Replace side part covering.
- > Replace side part frame.
- > Replace side part.
- > Replace clamping lever.
- > Replace mirror.



NOTE:

The steps for disassembly and assembly of the standard joystick box and the parking brake are only applicable to the respective types of wheelchair.

Complete Disassembly

- Lift seating system (electrically or manually) and lock, if necessary.
- Unscrew wing or Allen screws (7) and remove joystick box (17) or parking brake (16) together with the holding device from the armrest (1).
- Remove cap, if necessary, loosen nut (14) and pull the mirror (13) out of the side part frame (2).
- Loosen clamping lever (11) and remove side part (1) in upward direction.
- Unscrew clamp lever (9) completely and pull side part holder (8) out of the crossbeam (10).
- Loosen screws and washers (18) and detach the crossbeam (10) from the seat frame.
- Remove side part padding (5) from the side panel (4) (Velcro fastener).
- Rebore carefully the compression rivets (12) located on the lower part of the side panel (4) by means of a twist drill (3,5 to 4 mm) and detach the side panel (4) from the side panel frame (2).
- Loosen screws and washers (6) and remove the armrest padding (3) from the side panel frame (2).

Assembly

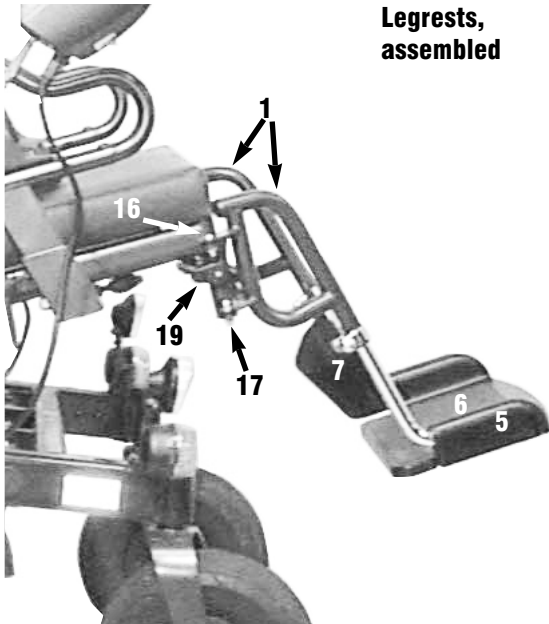
- The assembly is performed in the reverse order.



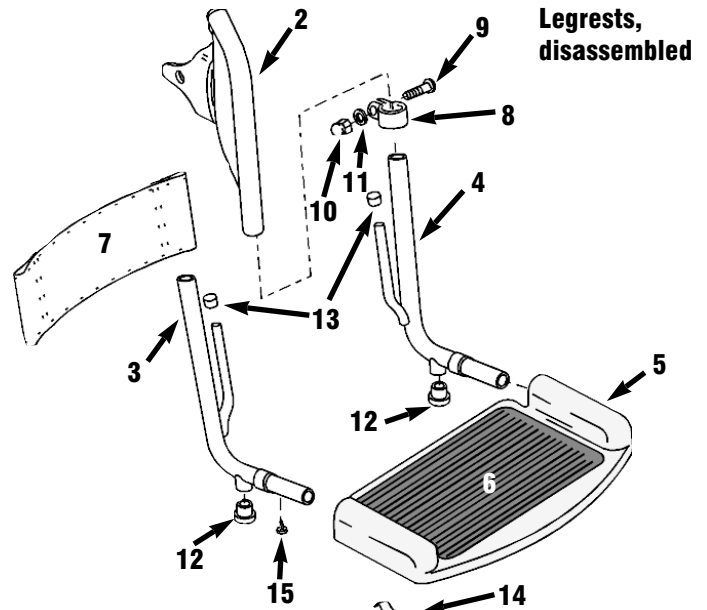
NOTE:

If necessary, replace the compression rivets (12) with plastic rivets or tapping screws during the assembly.

9.3 Legrests with Single Footboard.



**Legrests,
assembled**



**Legrests,
disassembled**

1 Legrests, complete

2 Legrest upper part, left

3 Insert tube 18,5 mm, right
(locked in the footboard)

4 Insert tube 18,5 mm, left

5 Sport footboard (ALU)

6 Rubber mat, glued

7 Calf belt

8 Clamp 22 mm

9 Button-headed screw M8x25

10 Cap nut M8

11 Washer 8,4x17x1,6

12 Slide piece SL 18

13 Caps A8

14 Leaf spring

15 Tapping screw 4,2x16

16 Hinge bolt 7,8x30 mm

17 Hinge bolt 7,8x35 mm

18 Plastic washers 7,8x20x1,0
for hinge bolt
(not shown)

19 Legrest locking device,
spring-weighed

Inspection

- Calf belt missing or damaged?
- Screwings loose?
- Rubber mat damaged?
- Footboard damaged?
- Footboard receptacle damaged?
- Weldment joints or insert tube defective?
- Weldment joints or upper part of legrest defective?
- Slide pieces or caps missing or damaged?

Remedy

- > Replace, exchange calf belt.
- > Tighten screwings.
- > Replace rubber mat.
- > Replace footboard.
- > Replace footboard receptacle.
- > Replace insert tube.
- > Replace footrest upper part.
- > Replace, exchange slide pieces or caps.

Complete Disassembly

- Remove calf belt (7) from insert tubes (3 and 4).
- Hold footboard (5) by its left side and turn upwards until it is released from the left insert tube (4).
- Release legrest locking (19) and lift legrest (1) from the hinge bolts (16 and 17).
- Loosen cap nut (10) and pull the legrest upper part (e.g. 2) from the insert tube (3 or 4).
- Loosen clamp (8) and detach from the legrest upper part (2).
- Unscrew tapping screw (15) completely and pull insert tube (3) out of the footboard (5).
- Remove leaf spring (14) from the footboard (5).
- If necessary, remove slide part (12) and caps (13) from the insert tubes (3 and 4).

Assembly

The assembly is performed in the reverse order.

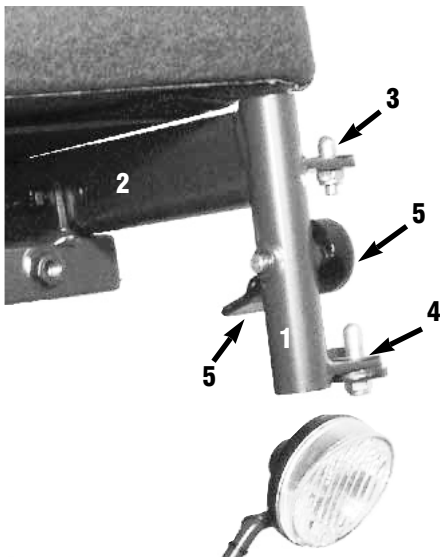


NOTE:

- When assembling, pay attention to the correct location of the parts (left, right).
- Insert leaf spring (14) correctly.
- Adjust legrests to the same length.

9.4 Legrest with One Piece Footboard for Short Lower Legs

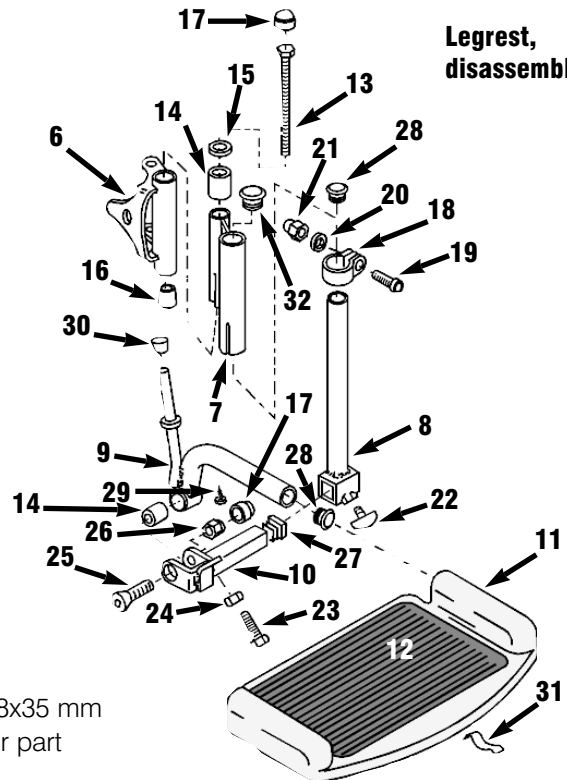
Legrest receptacle, left



- 1 Legrest receptacle
- 3 Hinge bolt 7,8x30 mm
- 5 Legrest lock, spring-weighted
- 7 Sliding tube
- 9 Footrest receptacle
- 11 Footrest (ALU)
- 14 Bushing 15x22x8,3
- 17 Cap SKS8
- 20 Washer 8,4x20x1,6
- 23 Locking screw M6x40
- 26 Nut M8 Stop
- 29 Tapping screw 4,2x13
- 32 Slide piece SL22

- 2 Seat frame
- 4 Hinge bolt 7,8x35 mm
- 6 Legrest upper part
- 8 Insert tube
- 10 Width compensation
- 12 Rubber mat, glued
- 15 Washer 8,4x20x1,6
- 18 Clamp 22 mm
- 21 Nut M8 Hut-Stop
- 24 Nut M6
- 27 Slide piece 15x15
- 30 Cap A8
- 33 Calf belt (not shown)

Legrest, disassembled



- 13 Hexagon head screw M8x120
- 16 Cone
- 19 Button-headed screw M8x25
- 22 Wing screw M6x10
- 25 Countersunk screw M8x40
- 28 Slide piece SL18
- 31 Leaf spring

Inspection

- Calf belt missing or damaged?
- Screwings loose?
- Rubber mat damaged?
- Footboard damaged?
- Footboard receptacle damaged?
- Weldment joints or sliding tube defective?
- Weldment joints or legrest upper part defective?
- Weldment joints or insert tube defective?
- Weldment joints or width compensation defective?
- Slide piece or caps missing or defective?

Remedy

- > Replace, exchange calf belt.
- > Tighten screwings.
- > Replace rubber mat.
- > Replace footboard.
- > Replace footboard receptacle.
- > Replace sliding tube.
- > Replace legrest upper part.
- > Replace draw-pull tube.
- > Replace width compensation.
- > Replace, exchange slide part or caps.

Disassembly, complete

The following steps apply to both legrests!

- Remove calf belt (33) from footboard receptacle (9).
- Grasp footboard (11) by its left side and turn upwards until it is released from the left footboard receptacle (9).
- Release legrest lock (5) and lift legrest from the hinge bolts (3 and 4).
- Loosen wing screw (22) and pull the footboard receptacle (9) with the width compensation (10) out of the insert tube (8).



NOTE:

In the preceding step, the footboard receptacle (9), the width compensation (10) and the footboard (11) of the right legrest are simultaneously separated from the insert tube (8).

- Release cap nut (21) and pull the insert tube (8) out of the slide tube (7).
- Loosen clamp (18) and remove from the slide tube (7) together with screw (19), washer (20) and cap nut (21).

The two following steps are applicable to the right legrest only!

- Release tapping screw (29) completely and pull the footboard receptacle (9) together with the width compensation (10) out of the footboard (11).
- Remove leaf spring (31) from the footboard (11).

The following steps are applicable to both legrests!

- Detach cap (17), release nut (26) from countersunk screw (25), and detach footboard receptacle (9) with bushing (14) from the width compensation (10).
- If required, unscrew locking screw (23) with counter nut (24) from the width compensation (10).
- Remove cap (17), unscrew hexagon head screw (13) from the cone (16) and detach screw (13) with washer (15), bushing (14) and cone (16) from the upper part of the legrest (6).
- Separate slide tube (7) from the upper part of the legrest (6).
- If necessary, remove slide pieces (27, 28 and 32) plus cap (30).



NOTE:

The slide pieces are inserted. They can be lifted by means of a suitable tool, for instance a screw driver.

Assembly

The assembly is performed in the reverse order.

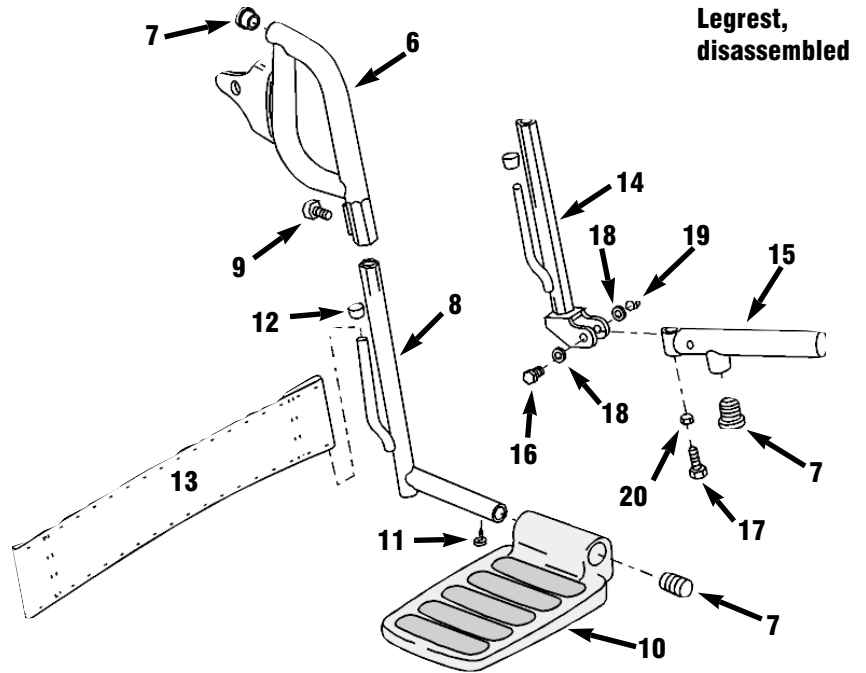
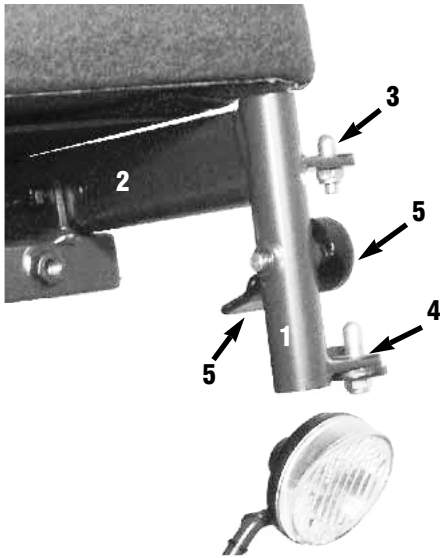


NOTE:

- During the assembly, please pay attention to the correct location of the parts (left, right).
- Insert leaf spring (31) correctly.
- Adjust legrests to equal length.
- Adjust locking screws (23) correctly and secure with nuts (24).

9.5 Standard Legrests and Standard Legrests with Angle Adjustment

Legrest receptacle, left



- | | | |
|------------------------|--------------------------------|--------------------------|
| 1 Legrest receptacle | 2 Seat frame | 3 Hinge bolt 7,8x30 mm |
| 4 Hinge bolt 7,8x35 mm | 5 Legrest lock, spring-weighed | 6 Legrest upper part |
| 7 Slide piece SL22 | 8 Legrest lower part | 9 Screw M8x10 |
| 10 Footplate, large | 11 Tapping screw 4,2x16 | 12 Cap A8 |
| 13 Calf belt | 14 Insert tube | 15 Footplate tube |
| 16 Screw M6x45 | 17 Locking screw M6x40 | 18 2x Washer RD 6x17x2,5 |
| 19 Nut M6 Cap Stop | 20 Nut M6 | |

✓ NOTE:

Items 14 to 20 are applicable for "standard legrests with angle adjustment" only.

Inspection

- Calf belt missing or damaged?
- Screwings loose?
- Weldment joints or legrest upper part defective?
- Footplate damaged?
- Weldment joints or legrest lower part defective?
- Weldment joints or insert tube defective?
- Weldment joints or footplate tube defective?
- Slide pieces or caps missing or damaged?

Remedy

- > Replace, exchange calf belt.
- > Tighten screwings.
- > Replace legrest upper part.
- > Replace footplate.
- > Replace legrest lower part.
- > Replace insert tube.
- > Replace footplate tube.
- > Replace, exchange slide pieces or caps.

Disassembly of Standard Legrests (complete)

- Detach calf belt (13) from legrest lower part (8).
- Release legrest lock (5) and lift legrest from hinge bolts (3 and 4).
- Loosen screw (9) and pull legrest upper part (6) from legrest lower part (8).
- Loosen tapping screw (11) completely and detach footplate (10) from legrest lower part (8).
- If required, remove slide pieces (7) and caps (12).

**NOTE:**

The slide pieces are inserted. They can be lifted up with a suitable tool, such as a screwdriver.

Assembly

The assembly is performed in the reverse order.

**NOTE:**

- During the assembly, pay attention to the correct location of the parts (left, right).
- Adjust legrests to equal length.

Disassembly of Standard Legrests with Angle Adjustment (complete)

- Detach calf belt (13) from the insert tube (14).
- Release legrest lock (5) and detach legrest from the hinge bolts (3 and 4).
- Loosen screw (9) and pull legrest upper part (6) from the insert tube (14).
- Loosen tapping screw (11) completely and detach footplate (10) from the footplate tube (15).
- Loosen nut (19) and, together with washer (18), separate from screw (16).
- Detach screw (16) and washer (18) and separate footplate tube (15) from the draw-pull tube (14).
- If required, loosen nut (20) and remove together with tapping screw (17).
- If required, remove slide pieces (7) and caps (12).

**NOTE:**

The slide pieces are inserted. They can be lifted out with an appropriate tool, such as a screwdriver.

Assembly

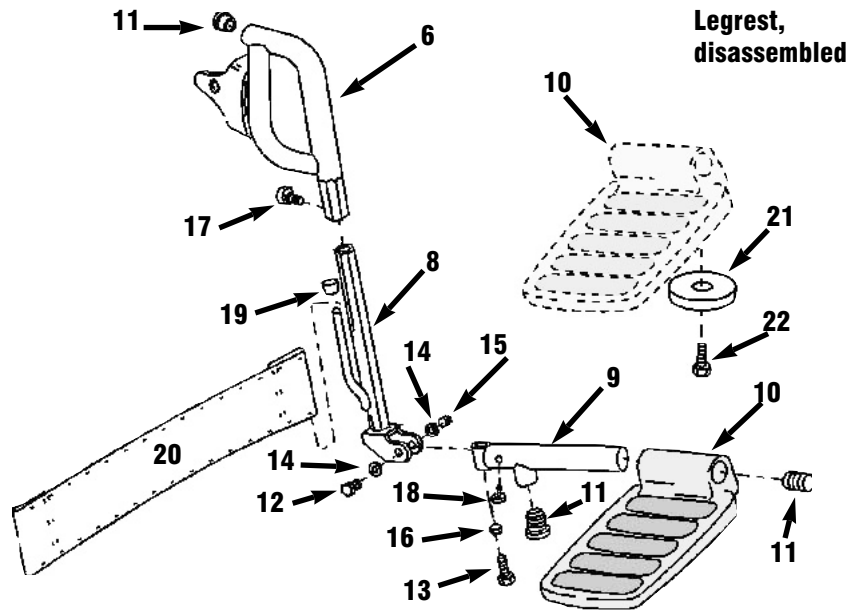
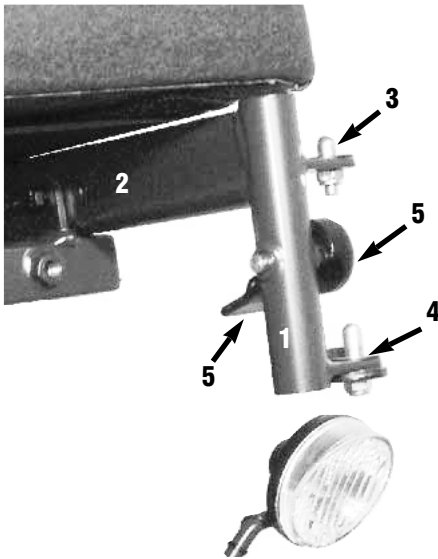
The assembly is performed in the reverse order.

**NOTE:**

- During the assembly, pay attention to the correct location of the parts (left, right).
- Adjust legrests to an equal length.
- Adapt locking screws (17) correctly and secure with nuts (20).

9.6 Legrests, 73 and 90 degrees, angle adjustable

Legrest receptacle, left



- | | | |
|------------------------|--------------------------------|-------------------------|
| 1 Legrest receptacle | 2 Seat frame | 3 Hinge bolt 7,8x30 mm |
| 4 Hinge bolt 7,8x35 mm | 5 Legrest lock, spring-weighed | 6 Legrest upper part |
| 7 Insert tube, conical | 8 Legrest lower part | 9 Footplate tube |
| 10 Footplate, small | 11 Slide piece SL22 | 12 Screw M6x45 |
| 13 Locking screw M6x40 | 14 2x washer RD 6x17x2,5 | 15 Nut M6 Cap-Stop |
| 16 Nut M6 | 17 Screw M8x10 | 18 Tapping screw 4,2x13 |
| 19 Cap A8 | 20 Calf belt | 21 Guard disc |
| 22 Screw M8x12 | | |

Inspection

- Calf belt missing or damaged?
- Screwings loose?
- Weldment joints or legrest upper part defective?
- Footplate damaged?
- Weldment joints or legrest lower part defective?
- Weldment joints or insert tube defective?
- Weldment joints or footplate tube defective?
- Slide pieces or caps missing or damaged?

Remedy

- > Replace, exchange calf belt.
- > Tighten screwings.
- > Replace legrest upper part.
- > Replace footplate.
- > Replace legrest lower part.
- > Replace insert tube.
- > Replace footplate tube.
- > Replace, exchange slide pieces and caps.

Disassembly (complete)

- Detach calf belt (20) from insert tube (7).
- Release legrest lock (5) and lift legrest from hinge bolts (3 and 4).
- Loosen screw (17) and pull legrest upper part (6) from the insert tube (7).
- Loosen tapping screw (18) completely and detach footplate (10) from the footplate tube (9).
- Loosen nut (15) and, together with washer (14), separate from screw (1).
- Detach screw (12) and washer (14) and separate footplate tube (9) from the insert tube. (7).
- If required, loosen nut (16) and remove together with locking screw (13).
- If required, remove slide piece (11) and caps (19).



NOTE:

The slide pieces are inserted. They can be lifted up with a suitable tool, such as a screwdriver.

- If necessary, loosen screw (22) and detach guard disc (21) from footplate (10).

Assembly

The assembly is performed in the reverse order.

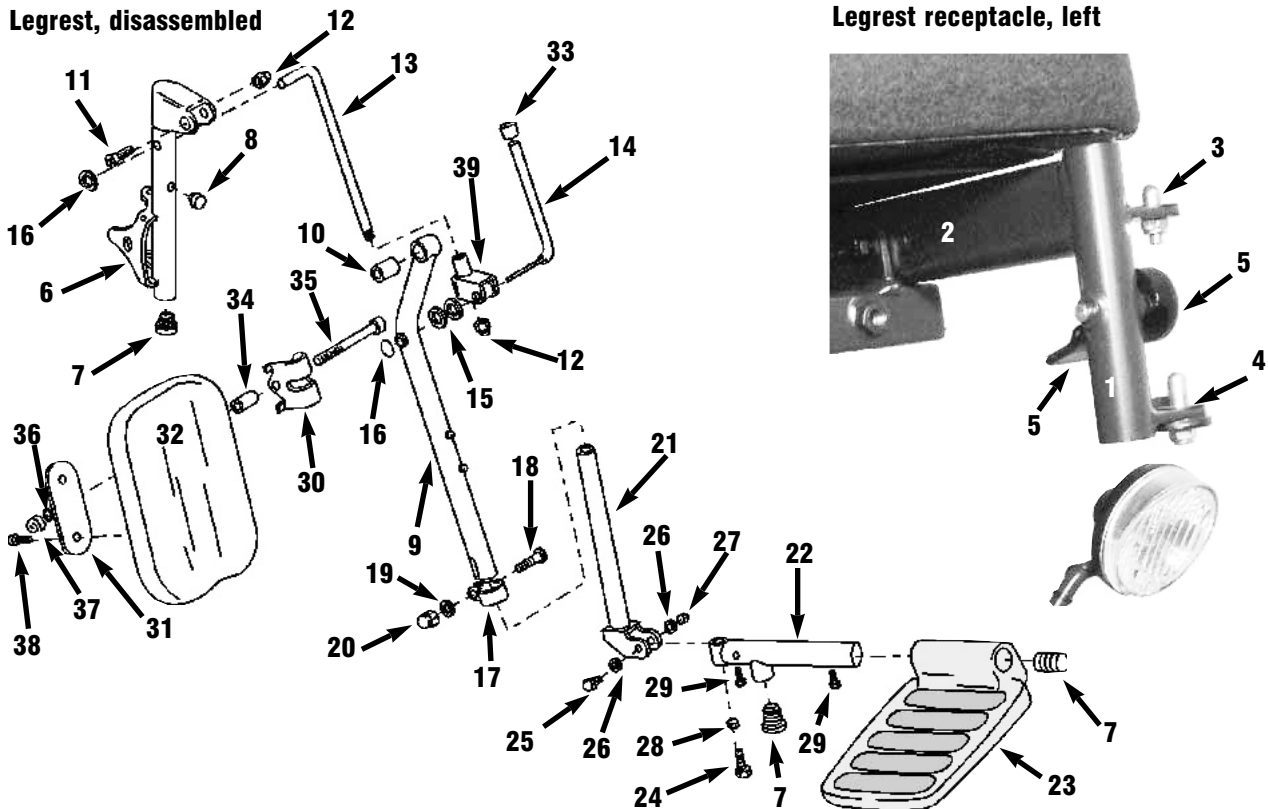


NOTE:

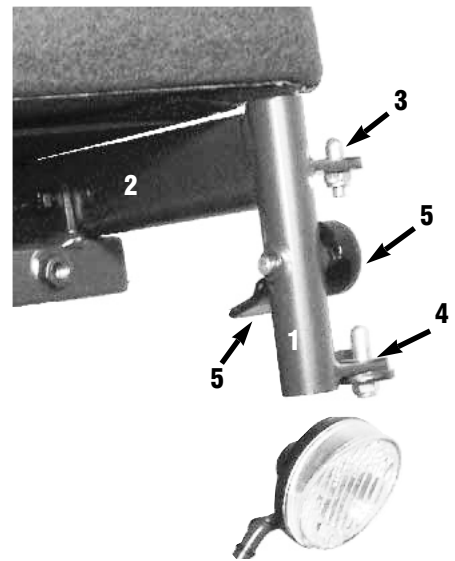
- During the assembly, pay attention to the correct location of the parts (left, right).
- Adjust legrests to an equal length.
- Adapt locking screws (17) correctly and secure with nuts (20).

9.7 Legrests, manually height adjustable

Legrest, disassembled



Legrest receptacle, left



- | | | |
|-------------------------------------|--|------------------------|
| 1 Legrest receptacle | 2 Seat frame | 3 Hinge bolt 7,8x30 mm |
| 4 Hinge bolt 7,8x35 mm | 5 Legrest lock, spring-weighted | 6 Legrest upper part |
| 7 3x slide piece SL22 | 8 Slide piece Y13x4x8 | 9 Legrest elbow tube |
| 10 Bushing RD 18x6x22 | 11 Screw M6x35 | 12 2x Nut M6 Cap-Stop |
| 13 Guide rod | 14 Release lever RD 8x185 | 15 2x Washer 20x7,9x1 |
| 16 2x Starlock cap 8mm | 17 Clamp 22mm | 18 Button-headed screw |
| 19 Washer 8,4x17x1,6 | 20 Nut M8-Hut | 21 Insert tube |
| 22 Footplate tube | 23 Footplate, large | 24 Tapping screw M6x40 |
| 25 Screw M6x45 | 26 2x Washer RD 6x17x2,5 | 27 Nut M6 Stop |
| 28 Nut M6 | 29 2x Tapping screw 4,2x9,5 | 30 Calfplate joint |
| 31 Calfplate holder | 32 Calfplate, black | 33 Cap A8 |
| 34 Bushing RD 15x3,35x22 | 35 Screw M8x80 | 36 Washer 8,4x17x1,6 |
| 37 Nut M8-Stop | 38 Screw M5x16 | |
| 39 Back-locking unit consisting of: | housing, release plate, release block and spring | |

Inspection

- Calfplate damaged?
- Screwings loose?
- Weldment joints or legrest upper part defective?
- Footplate damaged?
- Legrest elbow tube defective?
- Weldment joints or insert tube defective?
- Weldment joints or footplate tube defective?
- Adjustment mechanism defective?
- Slide piece or caps missing or damaged?

Remedy

- > Replace calfplate.
- > Tighten screwings.
- > Replace legrest upper part.
- > Replace footplate.
- > Replace legrest elbow.
- > Replace insert tube.
- > Replace footplate tube.
- > Repair, replace adjustment mechanism.
- > Replace, exchange slide pieces or caps.

Disassembly (complete)

- Release legrest lock (5) and lift legrest from the hinge bolts (3 and 4).
- Loosen nut (20) and pull insert tube (21), together with footplate tube (22) and footplate (23), from legrest elbow tube (9).
- Loosen screw (25) with washers (26) and nut (27) completely and separate insert tube (21) from footplate tube (22).
- If required, release locking screw (24) and nut (28) and detach from footplate tube (22).
- Loosen tapping screws (29) completely and detach footplate (23) from footplate tube (22).
- Loosen nut (20) completely and detach together with washer (19), screw (18) and clamping piece (17) from legrest elbow tube (9).
- Loosen two screws (38) and separate calfplate holder (31) from calfplate (32).
- Loosen nut (37) and, together with washer (36), bushing (34), screw (35) and calfplate holder (31, separate from calfplate joint (30).
- Loosen screws and remove calfplate joint (30) from legrest elbow tube (9).
- Lift up starlock cap (16), for example with a screw driver, to release the guide rod (13) from the legrest upper part.
- Loosen screw (11) and nut (12) completely and detach legrest elbow part (9) and bushing (10) from legrest upper part (6).
- Lift up Starlock cap (16), for example with a screw driver, to free the release lever (14).
- Pull release lever (14) from the legrest elbow tube (9) and detach the backlocking unit (39) together with washers (15) and guide rod (13) from the legrest elbow tube (9) .
- Release (12) nut and separate guide rod (13) from the backlocking unit (39).



NOTE:

Do not lose / misplace the individual parts of the backlocking unit (release plate, release block and spring).

- If necessary, remove slide pieces (7 and 8) and cap (33).



NOTE:

The slide pieces are inserted. They can be lifted up with a suitable tool, such as a screwdriver.

Assembly



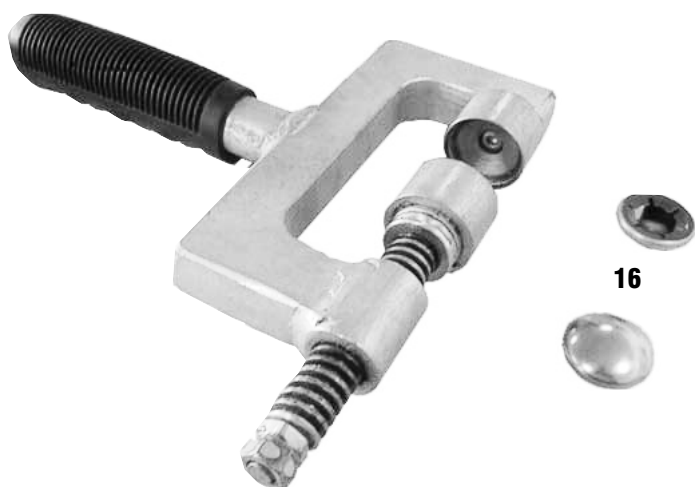
NOTE:

- The assembly is performed in the reverse order.
- When assembling, always use new starlock caps (16).
- During the assembly, attention is to be paid to the correct location of the parts (left, right).
- Adjust legrests to equal length.
- Adapt locking screws (24) correctly and secure with nuts (28).

For the assembly of the legrest elbow tube (9) and the legrest upper part (6), proceed as follows:

- Assemble the backlocking unit (39), insert guide rod (13) and screw on nut (12).
- Place backlocking unit (39) with washers (15) on legrest elbow tube (9) and insert the release lever (14).
- Insert starlock cap (16) into starlock tool and position tool correctly over the legrest elbow tube (9) and the release lever (14).
- Fasten tool at first handtight and afterwards tighten with a ring spanner until cap (16) is completely pressed on.
- Loosen starlock tool and remove.
- Insert the upper end of the guide rod (13) into the legrest upper part (6).
- Insert starlock cap (16) into the starlock tool and position tool correctly over the legrest upper part (6) and the guide rod (13).
- Fasten tool at first handtight and afterwards tighten with a ring spanner until the cap (16) is completely pressed on.
- Loosen starlock tool and remove.
- Assemble bushing (10), legrest elbow tube (9) and legrest upper part (6) and screw together with the screw (11) and the nut (12).
- The remaining assembly steps for the completion of the legrest are performed in reverse order of the disassembly.

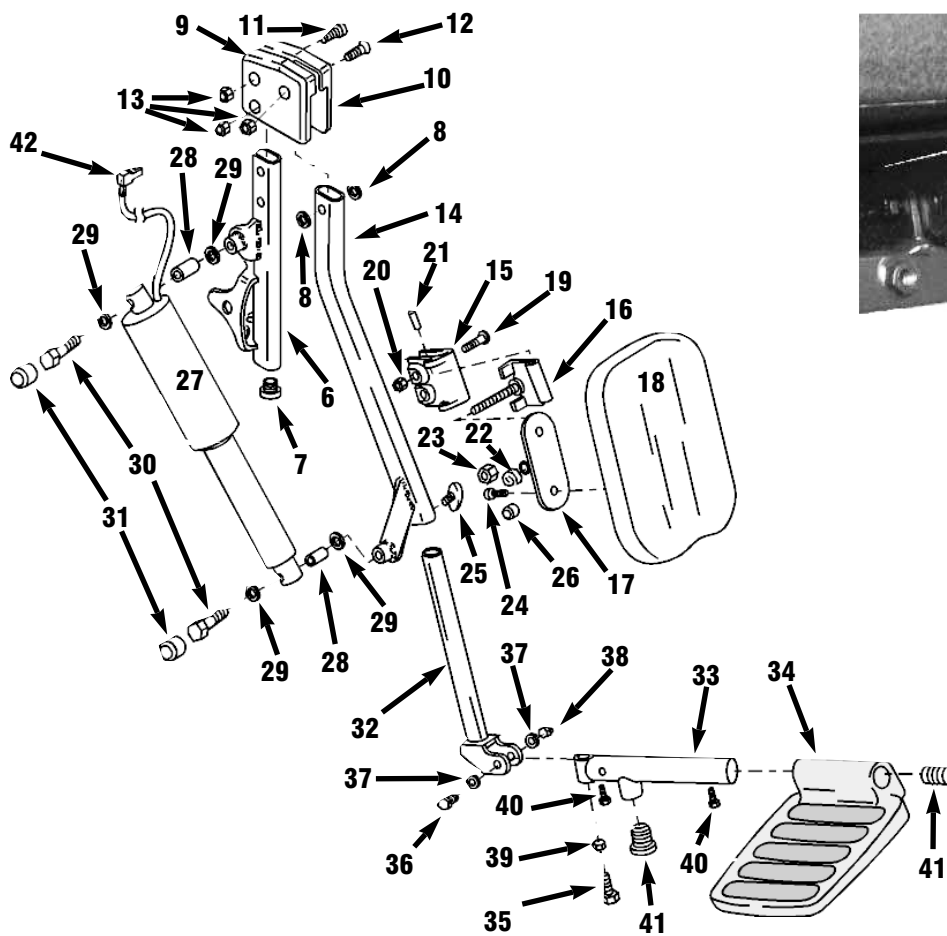
Starlock tool with caps



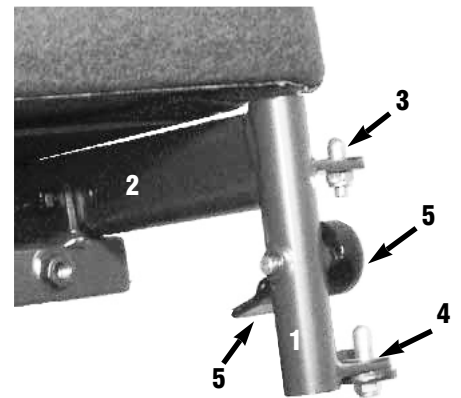
Insertion of the caps



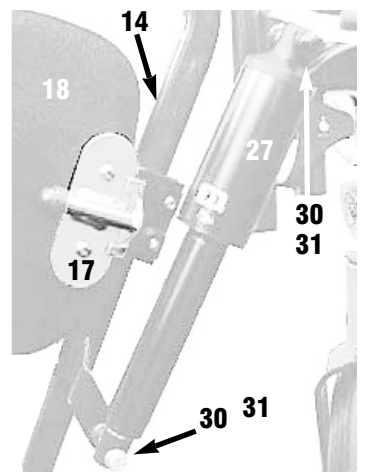
Legrest, disassembled



Legrest receptacle, left



Actuator motor, assembled



- | | | |
|----------------------------|-------------------------|--------------------------|
| 1 Legrest receptacle | 2 Seat frame | 3 Hinge bolt 7,8x30 mm |
| 4 Hinge bolt 7,8x35 mm | 5 Legrest locking, | 6 Legrest upper part |
| 7 Slide piece F 30x15 | 8 2x Washer 20x7,9x1 | 9 Joint plate |
| 10 Joint plate | 11 2x Screw M6x30 | 12 Phillips screw M6x40 |
| 13 3x Cap lock nut M6 | 14 Legrest elbow tube | 15 Clamping piece |
| 16 Calfplate rocker | 17 Calfplate holder | 18 Calfplate |
| 19 2x Phillips screw M5x25 | 20 2x Nut M5 Stop | 21 Dowel pin 5x20 |
| 22 Washer 8,4x17x1,6 | 23 Nut M8 Stop | 24 Phillips screw M5x16 |
| 25 Wing screw M6x10 | 26 Cap SKS8 | 27 Actuator cpl. LA22,5E |
| 28 2x Bushing RD 10x1x22,5 | 29 4x Washer 8,4x17x1,6 | 30 2x Screw M8x35 |
| 31 2x Cap SKS8 | 32 Insert tube | 33 Footplate tube |
| 34 Footplate, large | 35 Locking screw M6x45 | 36 Screw M6x40 |
| 37 2x Washer RD 6x17x2,5 | 38 Nut M6 Hut-Stop | 39 Nut M6 |
| 40 2x Tapping screw 4,2x13 | 41 2x Slide piece SL22 | 42 Connection plug |

Inspection

- Actuator motor, plug or cable defective?
- Calplate damaged?
- Screwings loose?
- Weldment joints or legrest upper part defective?
- Footplate damaged?
- Legrest elbow tube defective
- Weldment joints or insert tube defective?
- Weldment joints or footplate tube defective ?
- Calplate or calplate rocker defective?
- Slide pieces or caps missing or damaged?

Remedy

- > Check / replace actuator.
- > Replace calfplate.
- > Tighten screwings.
- > Replace legrest upper part.
- > Replace footplate.
- > Replace legrest elbow tube.
- > Replace insert tube.
- > Replace footplate tube.
- > Replace parts.
- > Replace, exchange slide pieces or caps.

Disassembly (complete)

- Remove connection plug (42) from the socket (in front, at lower part of battery holder).
- Remove caps (31) from screws (30).
- Loosen screws (30) at legrest upper part (6) and at legrest elbow tube (14) and detach the actuator (27) with bushings (28) and washers (29) completely.
- Release legrest locking (5) and lift legrest off the hinge bolts (3 and 4).
- Loosen wing screw (25) and pull the insert tube (32) with footplate tube (33) and footplate (34) from the legrest elbow tube (14).
- Loosen screw (36) with washers (37) and nut (38) completely and separate insert tube (32) from footplate tube (33).
- If required, loosen locking screw (35) and nut (39) and detach from footplate tube (33).
- Loosen tapping screws (40) completely and detach footplate (34) from footplate tube (33).
- Loosen Phillips screws (19) completely and, together with nuts (20), detach from clamping piece (15).
- Detach clamping piece (15) completely with calfplate (18) from the legrest elbow tube (14).
- Loosen two Phillips screws (24) and separate calfplate holder (17) from calfplate (18).
- Remove cap (26), loosen nut (23) and detach together with washer (22).
- Detach calfplate holder (17) from the calfplate rocker (16).
- Remove dowel pin (21) and detach calfplate rocker (16) from clamping piece (15).
- Loosen Phillips screw (12) and nut (13) completely and detach legrest elbow tube (14) with washers (8) from joint plates (9 and 10).
- Loosen two screws (11) and nuts (13) completely and detach joint plates (9 and 10) from legrest upper part (6).
- If necessary, remove slide pieces (7 and 41).



NOTE:

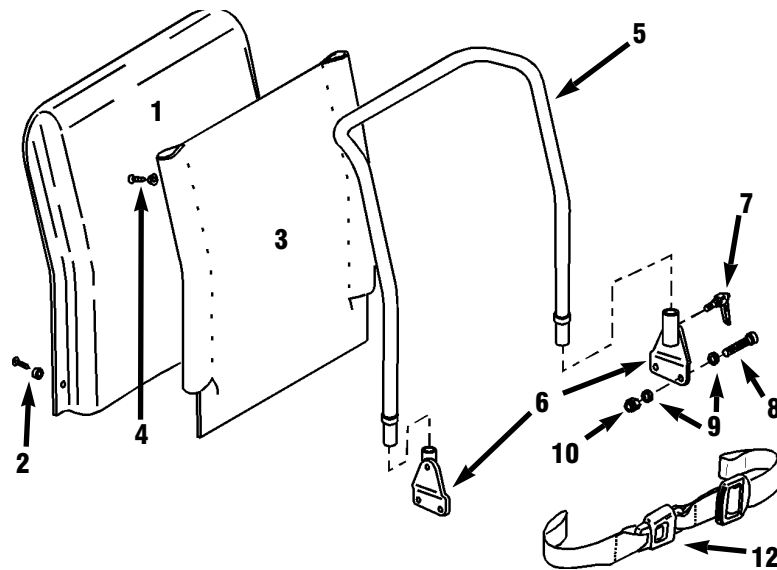
The slide pieces are inserted. They can be lifted up with a suitable tool, such as a screwdriver.

Assembly

The assembly is performed in the reverse order.

9.9 Back Element, anatomical, in Standard and Comfort versions

Back element, disassembled

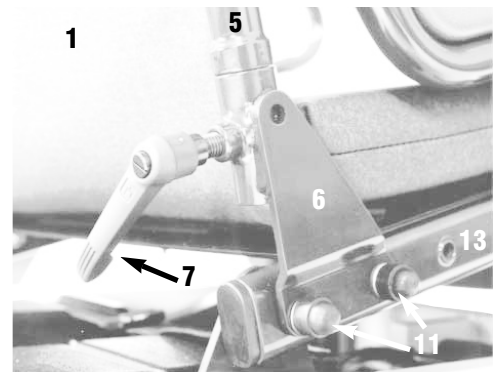


- 1 Back padding, anatomical
- 4 Tapping screw with cap
- 7 Clamping lever M8x10
- 10 Lock nut M8
- 13 Seat frame

- 2 Tapping screw with cap
- 5 Back frame tube
- 8 2x Hexagon screw M8x50
- 11 4x Caps SKS8

- 3 Back belting
- 6 Back element holder
- 9 4x Washer 21x8,3x1,5
- 12 Safety belt

Back element, assembled



NOTE:

The back element can be equipped with back padding (1) or with back belting (3).

Inspection

- Back padding damaged?
- Back belt damaged?
- Safety belt damaged?
- Screwings loose?
- Weldment joints oder back frame tube defective?
- Back element holder damaged?

Remedy

- > Replace back padding.
- > Replace back belt.
- > Replace safety belt.
- > Tighten screwings.
- > Replace back frame tube.
- > Replace back element holder.

Disassembly complete

- If existing, then remove the headrest first. See chapter 9.1. in this respect.
- Loosen clamping lever (7) and pull back frame tube (5) from the back element holders(6).
- Detach safety belt (12) from the backframe tube (5).
- Remove tapping screws with caps (4) and detach back belting (3) from the back frame tube (5) or remove tapping screws with caps (2) and detach back padding (1) from the back frame tube (5).
- Remove caps (11) and loosen nuts (10) completely.
- Remove screws (8) with washers (9) and detach back element holder (6) from seat frame (13).



CAUTION:

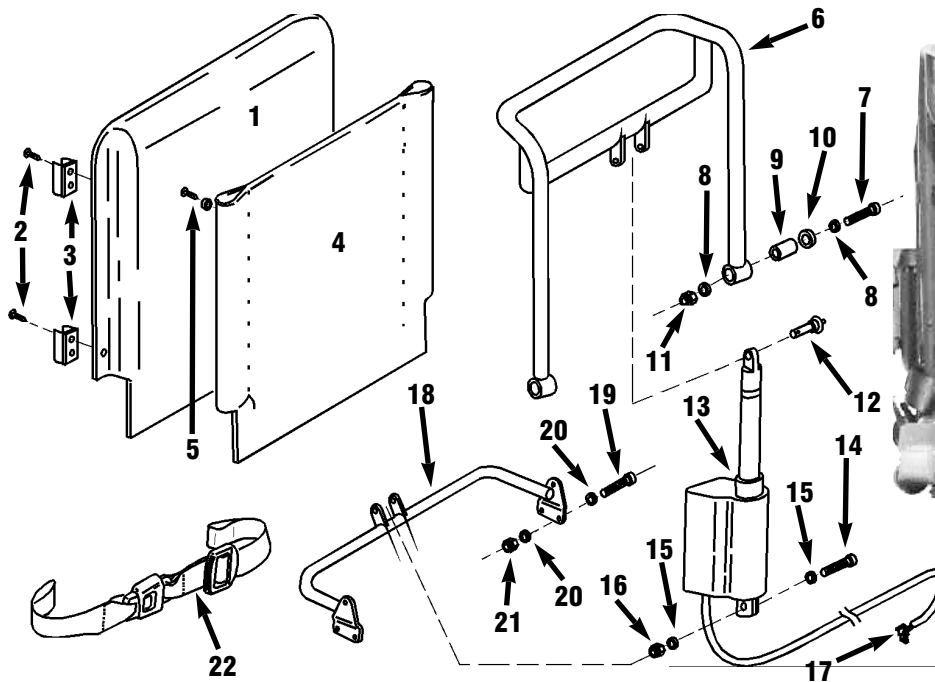
Detach only one back element holder from the seat frame at a time. If both back element holders are removed at the same time, then the seat frame will be supported only by the threaded spindle or the actuator of the seat inclination adjustment and will become unstable.

Assembly

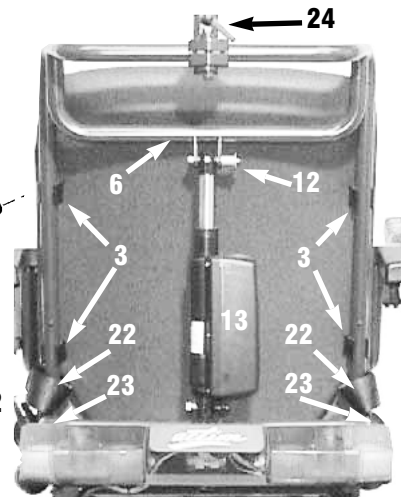
- The assembly is performed in the reverse order.

9.10 Back Element electrically adjustable in versions Standard and Comfort

Back element, disassembled



Back element, assembled



- | | | |
|--------------------------------|---------------------------------|----------------------------|
| 1 Back padding | 2 8x Counters.tapp.screw 4,8x17 | 3 4x Clamping piece |
| 4 Back belting | 5 4x Counters.tapp. screw w/cap | 6 Back frame tube |
| 7 2 Hexagon head screw M8x45 | 8 2x Washer 16x8,3x1,5 | 9 2x Bushing 12x8,5x23 |
| 10 4x Washer 24x8,3x2 | 11 2x Lock nut M8 | 12 Quick-release bolt |
| 13 Actuator motor | 14 Hex. head cap screw M10x50 | 15 2x Washer 19,5x10,5x2,1 |
| 16 Lock nut M10 | 17 Connection plug | 18 Support bracket |
| 19 4x Hexagon head screw M8x50 | 20 8x Washer 16x8,3x1,5 | 21 4x Lock nut M8 |
| 22 Safety belt | 23 Seat frame | 24 Headrest holder |



NOTE:

The back element can be equipped with back padding (1) or with back belting (4)

Inspection

- Back padding damaged?
- Backbelting damaged?
- Safety belt damaged?
- Screwings loose?
- Weldment joints or back frame tube defective?
- Support bracket damaged?
- Actuator or cable defective?
- Connector plug defective?
- Quick-release bolt defective?

Remedy

- > Replace back padding.
- > Replace back belt.
- > Replace safety belt.
- > Tighten screwings
- > Replace back frame tube.
- > Replace support bracket
- > Check/replace actuator (chapt. 14.0).
- > Replace connector plug.
- > Replace quick-release bolt.

Disassembly complete

- If existing, then remove the headrest first. See chapter 9.1 in this respect.
- Remove connection plug (17) from the socket (in front, on the lower part of battery holder).
- Remove quick-release bolt (12) on the upper part of the back frame tube (6) and put the actuator aside.
- Loosen nut (16), at lower part of support bracket (18), completely, and detach together with washer (15).
- Support the actuator with your hand, remove screw (14) with washer (15), and detach the actuator.
- Loosen nuts (11) at lower part of support bracket (18) and detach together with washers (8).
- Support the back frame tube (6) with your hand and remove screws (7) with washers (8 and 10) from the support bracket (18). Then detach the back frame tube.
- Detach safety belt (12) from back frame tube (6).
- Press bushings (9) outwards from the bush bearing in the back frame tube.



NOTE:

The bushings can only be removed from the inside to the outside.

•

Loosen tapping screws with caps (5) completely and remove back belting (4) from the back frame tube (6) or press the back padding (1) from the back frame tube (6).



NOTE:

The back padding can be removed even if the back frame tube is assembled.

- If required, remove countersunk tapping screws (2) and detach the clamping piece (3).
- If required, loosen nuts (21) completely and detach together with washers (20).
- If required, hold the support bracket (18) with your hand, remove screws (19) with washers (20) and detach support bracket (18) from the seat frame.



CAUTION:

Do not remove the support bracket (18) completely, as otherwise, the seat frame would be supported only by the threaded spindle and the actuator of the seat inclination adjustment and would thus become unstable. As to the disassembly of the support bracket, see chapter 9.14.

Assembly

- The assembly is performed in the reverse order.

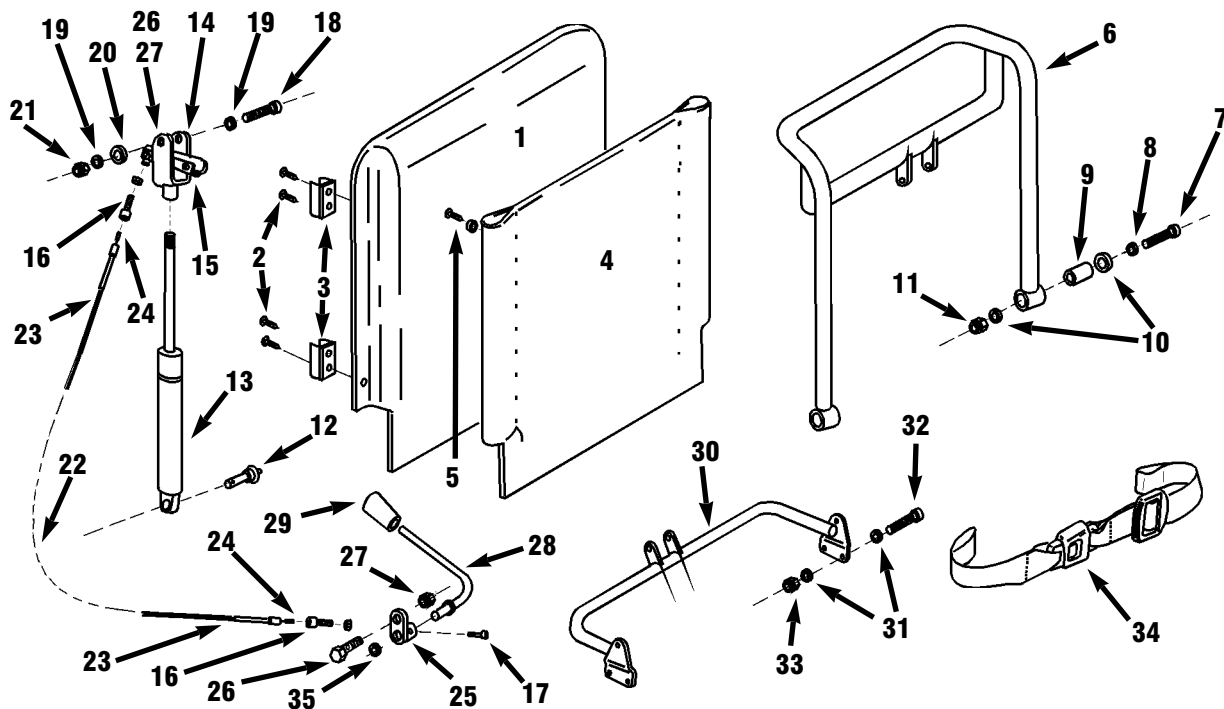


NOTE:

Insert the back padding (1) carefully in order not to damage the clamping pieces (plastic).

9.11 Back Element, Manually Adjustable, in Standard and Comfort Versions

Back element, disassembled



- | | | |
|-----------------------------------|---------------------------------|-----------------------------------|
| 1 Back padding | 2 8x Counters.tapp.screw 4,8x17 | 3 4x Clamping piece |
| 4 Back belting | 5 4x Tapping screw with cap | 6 Back frame tube |
| 7 2x Hexagon head screws M8x45 | 8 2x Washer 16x8,3x1,5 | 9 2x Bushing 12x8,5x23 |
| 10 4x Washers 24x8,3x2 | 11 2x Lock nut M8 | 12 Quick-release bolt |
| 13 Compression spring | 14 Fork-shaped piece M10x1 | 15 Flat link for fork-shaped pce. |
| 16 2x Locking screw + counter nut | 17 Screw | 18 Hexagon head screw M10x50 |
| 19 2x Washer 19,5x10,5x2,1 | 20 Bushing | 21 Lock nut M10 |
| 22 Bowden wire | 23 Bowden wire covering | 24 2x End cap for Bowden wire |
| 25 Bowden wire receptacle | 26 Clamping screw | 27 Nut for clamping screw |
| 28 Adjusting lever | 29 Cylinder-shaped button | 30 Support bracket |
| 31 8x Washer 16x8,3x1,5 | 32 4x Hexagon head screw M8x50 | 33 4x Lock nut M8 Stop |
| 34 Safety belt | 35 Starlock cap | |

✓ NOTE:

The back element can be equipped with back padding(1) or with back belt (4).

Inspection

- Back padding damaged?
- Back belting damaged?
- Safety belt damaged?
- Screwings loose?
- Weldment joints or back frame tube defective?
- Support bracket damaged?
- Check compression spring and Bowden wire!
- Bowden wire defective?
- Bowden wire covering defective?
- Compression spring defective?
- Flat link in fork-shaped pce. tight or defective?
- Fork-shaped piece defective?
- Quick-release bolt defective?
- Adjusting lever defective?

Remedy

- > Replace back padding.
- > Replace back belting.
- > Replace safety belt.
- > Tighten screws.
- > Replace back frame tube.
- > Replace support bracket.
- > Readjust Bowden wire.
- > Replace Bowden wire.
- > Replace Bowden wire covering.
- > Replace compression spring.
- > Loosen or replace flat link.
- > Replace fork-shaped piece.
- > Replace quick-release bolt.
- > Replace adjusting lever.

Disassembly, complete



NOTE:

- It is not absolutely necessary to follow each and every operational step indicated here. The compression spring and the Bowden wire, for instance, can be mounted or dismounted without having first to remove the entire backframe.
 - Mark or write down the exact locations of the locking screws and counter nuts (16) before detaching the Bowden wire (22) / the Bowden covering (23).
 - The Bowden wire (22) is provided with final caps (24) on both ends (24), which might have to be pinched off before the disassembly.
 - The adjusting lever (28) is housed in the seat frame and locked with a starlock cap (35). To detach the lever, the seat cushion and the seat plate should be removed first. See chap. 9.12. in this respect.
- If there is a headrest, then remove the headrest first. See chapter 9.1. in this respect.
 - Remove quick-release bolt (12) at the lower part of the support bracket (30).
 - Loosen nut (21), located at the upper part of the back frame tube (6), completely and detach together with washer (19).
 - Support the compression spring (13) with your hand, remove screw (18) with washer (19) and bushing (20), and detach compression spring together with the entire fork-shaped piece (14) and put aside.
 - Loosen nuts (11), located at the lower part of the support bracket (30), and detach together with washers (10).
 - Support the back frame tube (6) with your hand and remove screws (7) with washers (8 and 10) from the support bracket (18). Then detach the back frame tube.
 - Detach safety belt (34) from the back frame tube (6).
 - Press bushings (9) outwards from the bushing seats in the back frame tube.
- **NOTE:**

The bushings can only be removed from the inside to the outside.
- Loosen tapping screws with caps (5) completely and detach the back belt (4) from the back frame tube (6) or press the back padding (1) out of the back frame tube (6).
- **NOTE:**

The back padding can be removed even if the back frame tube is mounted.
- If necessary, remove the countersunk tapping screws (2) and detach the clamping pieces (3).
 - Rotate the compression spring (13) out of the fork-shaped piece (14).
 - Loosen clamping screws (26) and nuts (27) to free the Bowden wire (22).
 - Loosen counter nuts and locking screws (16) and detach the Bowden wire (22) with its covering (23) from the fork-shaped piece (13) and the Bowden wire receptacle (25).
 - Pinch off the final caps (24) and pull the Bowden wire (22) from its covering (23).
 - Lift off the Starlock cap (35), loosen screw (17) and detach the adjusting lever (28) together with the Bowden wire receptacle (25) from the seat frame.
 - If necessary, loosen nuts (33) completely and detach together with washers (31).
 - If necessary, hold the support bracket (18) with your hand, remove screws (32) with washers (31) and detach support bracket (18) from the seat frame.



CAUTION:

Do not remove support bracket (18) completely, as otherwise the seat frame will only be supported by the threaded spindle or the actuator of the seat inclination adjustment and thus will become instable. As to the disassembly of the support bracket, see chapter 9.14.

Assembly

- Proceed with the assembly in the reverse order.



NOTE:

- When assembling, the compression spring must be screwed into the fork-shape piece up to the limit stop.
- The Bowden wire must be adjusted in a way that, with the compression spring screwed in, the flat link in the fork-shaped piece has a play of about 15 mm when the adjusting level is moved.
- After a new Bowden wire has been pulled in, the final caps must be squeezed off.
- Insert the back paddings (1) carefully in order not to damage the clamping pieces (plastic).

9.12 Seat cushion, apron with pocket, and seat plate

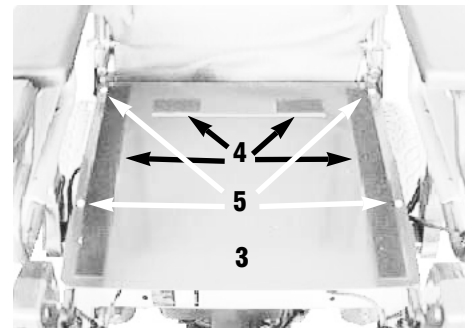
Storm Comfort, complete



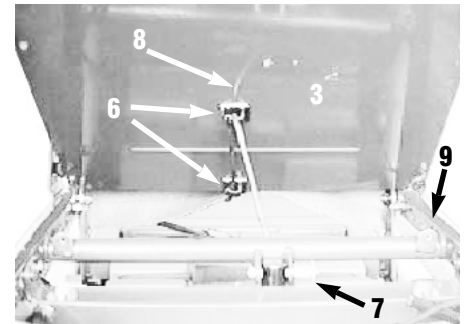
- 1 Seat cushion
- 4 Velcro fastener strips, glued
- 7 Quick release bolt

- 2 Apron with pocket
- 5 4x Tapping screw 4,8x18
- 8 Connection cable

Seat plate, mounted



Seat plate from below (lifted)



- 3 Seat plate
- 6 Cable clamps, glued



NOTE:

- The seat plate can be provided with different types of seat cushions.
- The Velcro fastener strips under the seat cushion are clamped.

Inspection

- Seat cushion damaged?
- Apron with pocket damaged?
- Velcro fastener damaged?
- Screwings loose?
- Seat plate damaged?
- Cable clamps damaged?

Remedy

- > Replace seat cushion.
- > Replace apron with pocket.
- > Replace Velcro fastener.
- > Tighten screwings.
- > Straighten, replace seat plate.
- > Replace cable clamps.

Disassembly, complete

- Lift seat cushion (1) slightly at the front and pull upwards from the seat plate (3).
- Remove apron with pocket (2) from the seat plate.
- If necessary, lift seating system (electrically or manually) and lock, if appropriate.



NOTE:

For a mechanical seat recline adjustment, loosen first the quick release bolt (7). After that, the seat (3) can be lifted completely. The seat should be supported by means of a suitable object.

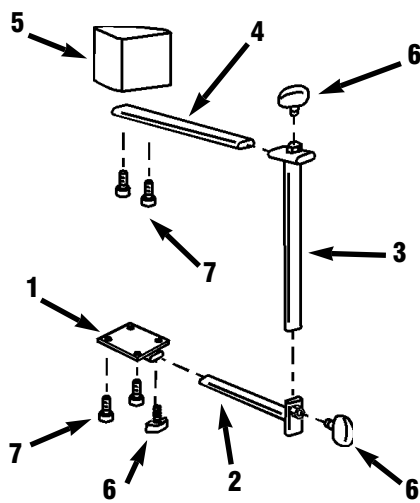
- If required, press connector cable (8) for the actuator out of the cable clamps (6).
- Remove tapping screws (5) entirely and lift the seat plate (3) from the seat frame (9).
- If required, remove defective Velcro fasteners (4) or cable clamps (6) from the seat plate (3) and replace (glue).

Assembly

- Proceed with the assembly in reverse order.

9.13 Wedge cushion, complete

Wedge cushion, disassembled



- 1 Wedge cushion holder
- 2 Insert tube A
- 3 Insert tube B
- 4 Insert tube C
- 5 Wedge cushion
- 6 3x Wing screws M6x10
- 7 6x Screws

Inspection

- Wedge cushion damaged?
- Insert tube damaged?
- Wedge cushion holder damaged?
- Screwings loose?

Remedy

- > Replace wedge cushion.
- > Replace insert tube
- > Replace wedge cushion holder.
- > Tighten screwings.

Disassembly, complete

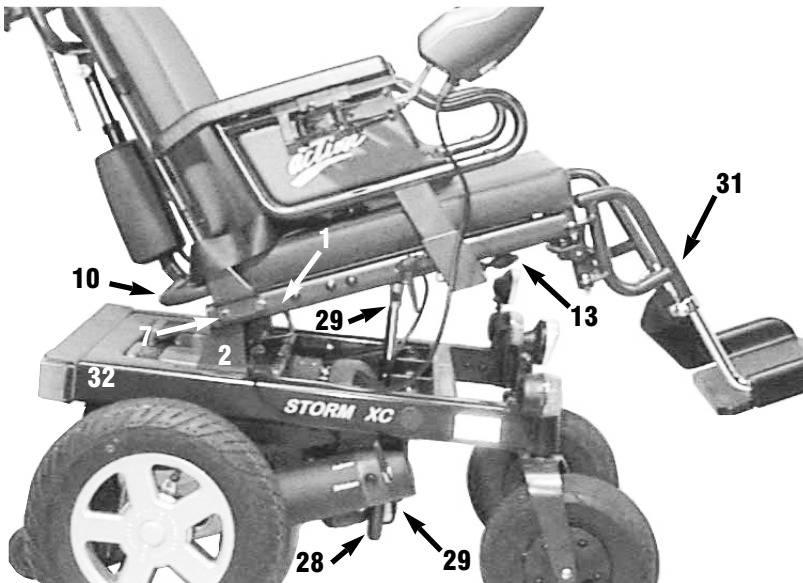
- Loosen wing screws (6) and separate the insert tubes from each other.
- Loosen two screws (7) and detach the wedge cushion (5) from the insert tube C (4).
- If required, lift seating system (electrically or manually) and lock, if appropriate.
- Loosen four screws (7) and detach the wedge cushion holder from the seat frame.

Assembly

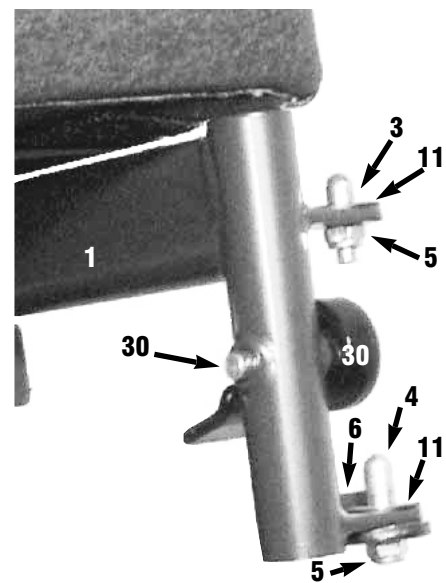
- Proceed with the assembly in reverse order.

9.14 Seat frame, complete

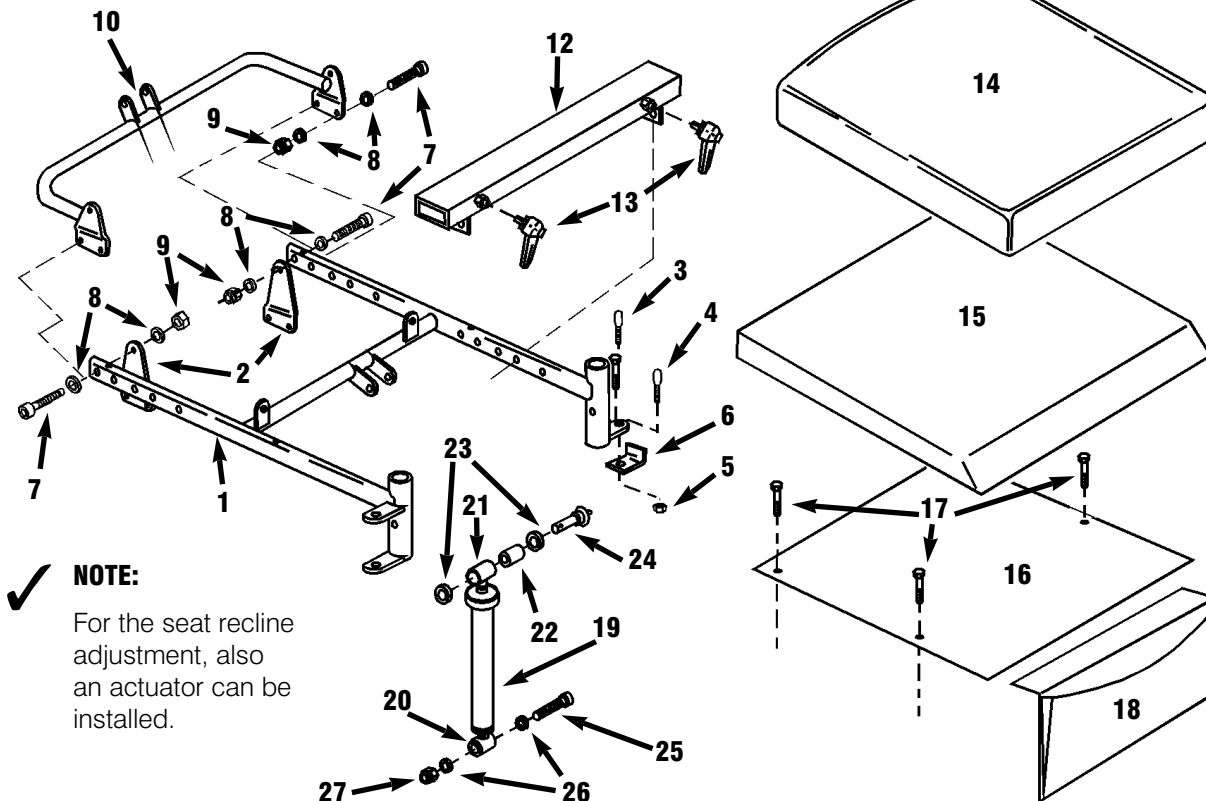
Storm Comfort with seat frame, assembled



Legrest receptacle, left



Seat frame, disassembled



NOTE:

For the seat recline adjustment, also an actuator can be installed.

- | | | |
|---|----------------------------------|---------------------------------|
| 1 Seat frame | 2 2x Mounting plate | 3 2x Hinge bolt 7,8x30 |
| 4 2x Hinge bolt 7,8x35 | 5 4x Lock nut M6 | 6 2x Limit-stop plate |
| 7 4x Hexagonal head screw M8x50 | 8 8x Washer 16x8,3x1,5 | 9 4x Lock nut M8 |
| 10 Support bracket | 11 4x Plastic disc 20x8x1 | 12 Crossbeam |
| 13 Clamping lever M8x60 | 14 Seat cushion, firm padding | 15 Seat cushion, standard |
| 16 Seat plate | 17 4x Tapping screw 4,8x18 | 18 Apron with pocket |
| 19 Seat recline adjustment, manually | 20 Threaded spindle, left-handed | 21 Spindle, right-handed thread |
| 22 Bearing bush 18x10,2x22 | 23 2x Washers 24x10,2x2 | 24 Quick-release bolt |
| 25 Hexagonal head screw M10x50 | 26 2x Washers 19,5x10,2x2 | 27 Nut M10 Stop |
| 28 Battery box holder | 29 Actuator | 30 Legrest lock, consisting of: |
| locking lever, bolt 8x6x50, spring 8x30 and lock nut M5 | | 31 Legrests |
| 32 Chassis | | |

Inspection

- Legrest locking tight or defective?
- Hinge bolt damaged?
- Actuator, cable or plug defective?
- Seat recline adjustment damaged?
- Screwings loose?
- Clamping lever damaged?
- Crossbeam damaged?
- Mounting plate damaged?
- Seat cushion, seat plate or apron with pocket damaged?
- Weldment joints at frame or frame damaged?

Remedy

- > Smoothen or replace locking device.
- > Replace hinge bolt.
- > Check / replace actuator. See chapter 14.0.
- > Repair / replace recline adjustment.
- > Tighten screwings.
- > Replace clamping lever.
- > Replace crossbeam.
- > Replace mounting plate.
- > Repair / replace parts. See chapter 9.12.
- > Weld or replace frame.



NOTE:

For maintenance and repair work on the chassis (32) or on the seating system itself, the entire seating system can be separated from the chassis as follows:

- Detach joystick box and brake lever from the side parts.
- If necessary, detach the electrical connections of the actuators (legrest and backrest adjustments).
- Remove legrests (31).
- Detach connection cables from the cable clamps (under the seat).
- Remove the quick-release bolt (24) of the seat recline adjustment (19) or of the actuator (29).
- Move the seating system forward and place on top of chassis (32).
- Loosen nuts (9) located on the upper part of the mounting plates (2) completely and detach together with the washers (8) from the screws (7).
- Support seating system, remove screws (7) with washers (8) and detach the seating system from the chassis (32) completely.

Disassembly / assembly of seat cushions, seat plate and apron with pocket

- For disassembly / assembly see chapter 9.12.

Disassembling legrest receptacle completely

- If necessary, detach the electrical connections for the actuators (legrest adjustment).
- Release legrest locking (30) and detach legrests (31).
- Use a suitable sleeve, such as a leather strip, and hold the locking bolt with a pair of tongs.
- Loosen nut (M5) completely and detach, together with bolt, spring and locking lever, from the seat frame (1).
- Remove plastic discs (11) from the hinge bolts (3 and 4).
- Use a suitable sleeve, such as a leather strip, and hold hinge bolts (3 and 4 respectively) with a pair of tongs.
- Detach nuts (5) completely and remove hinge bolts (3 and 4 respectively), if appropriate, together with limit-stop plate (6), from the seat frame (1).

Assembly

- The assembly is performed in reverse order.

Disassembly Seat Recline Adjustment, complete

- **Only in electrical legrest adjustment:** Remove connection plugs from the sockets (in front, below) at the battery box retainer (28).
 - Release legrest locking device (30) and detach legrests (31).
 - Release quick-release bolt (24) above at the seat recline adjustment (19) or at the actuator (29) and remove together with washers (23), if necessary.
 - **Only in actuator:** Remove connection plug (in front, below) at the battery box retainer (28).
 - Loosen nut (27) completely and remove together with washer (26) from the screw (25).
 - Support the actuator (29) or the seat recline adjustment device (19) with your hand, remove screw (25) with washer (26) and detach actuator (29) or adjustment device (19) from the seat frame (1).
 - **Only in actuator:** Loosen nut M8 at the connecting rod and detach together with washer. Detach screw M8 together with washer and remove the top of the connecting rod from the connecting rod of the actuator. Unscrew threaded rods (20 and 21) from the adjustment device - (19). If necessary, press bushing (22) out of the threaded rod (21).
- Only in manual adjustment:**

Assembly

- The assembly is performed in reverse order.

Disassembly, Seat Frame complete

- If necessary, remove headrest. See chapter 9.1 in this respect.
- Detach joystick box and, if necessary, brake lever, from the side parts. See chapter 9.2. in this respect.
- Remove side parts from the seat frame (1). See Chapter 9.2 in this respect.
- Remove back element entirely. See in this respect chapters 9.9 to 9.11, depending on models.
- If necessary, remove the wedge cushion completely. See chapter 9.13 in this respect.
- Remove seat cushion, seat plate and apron with pocket. See chapter 9.12 in this respect.
- If necessary, detach the connection cables of the actuators and separate the connection cables from the cable clamps.
- Release legrest lock (30) and detach legrests (31).
- Release quick-release bolt (24) of the seat recline adjustment (19) or the actuator (29) and place the seat frame (1) forward on top of the chassis (32).
- Loosen nuts (9) at the upper part of the mounting plates (2) completely and detach together with washers (8) from the screws (7).
- Support the seat frame (1), remove screw (7) with washers (8) and lift the entire seat frame off the chassis (32).
- Remove screws (7) with washers (8) and nuts (9) completely and detach support bracket (10) from the seat frame (1).
- Remove four screws M6x20 with washers (not shown) completely and detach crossbeam (12) from the seat frame (1).
- If necessary, remove clamping lever (13).
- If necessary, loosen two screws M8x20 with washers (not shown) at the lower part of the mounting plate (2) completely and detach mounting plate from chassis (32).

Assembly

- The assembly is performed in reverse order.

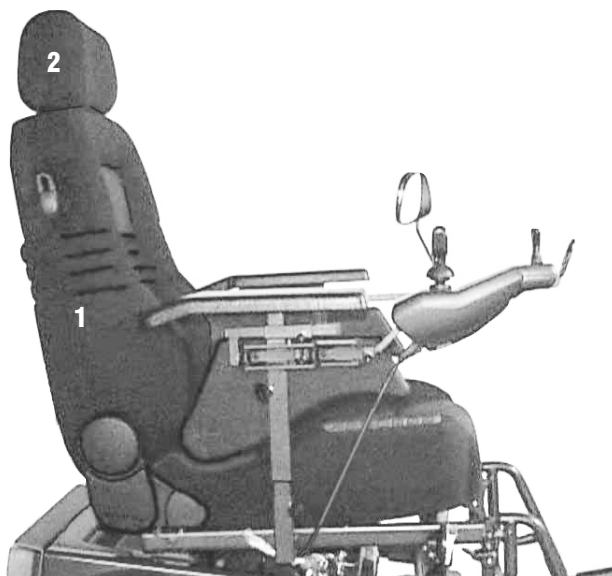
10.0 Check and Repair Work on the Recaro Seating System

10.1 General

Chapter 10 and its sub-chapters are dedicated to the description of the special features of the Recaro seating system. As to the disassembly / assembly of the legrests, the steps described in chapter 9 for the standard seating system are applicable.

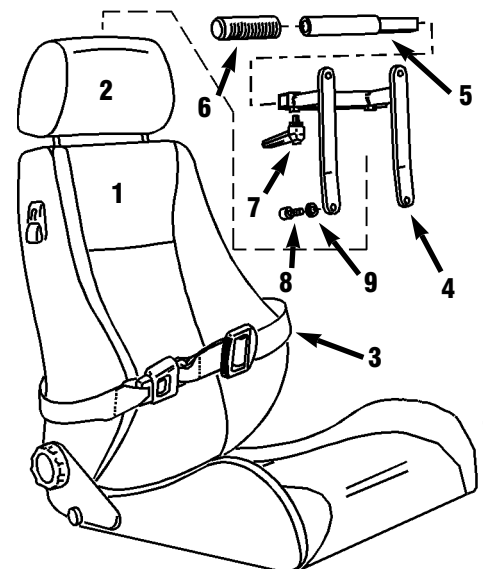
10.2 Headrest, Safety Belt and Push Handle

Recaro seat, assembled



- | | |
|--------------------------|----------------|
| 1 Back module | 2 Headrest |
| 4 Holder for push handle | 5 Push bar |
| 7 Clamping lever M6x10 | 8 4x Screws M6 |

Recaro seat, disassembled



- | |
|---------------|
| 3 Safety belt |
| 6 Handle |
| 9 4x Washers |



NOTE:

The Recaro seat can be designed as a complete seating module (model DS) with integrated control, or as model LX with detachable headrest and back module.

Inspection

- Headrest damaged?
- Safety belt damaged?
- Push handle damaged?
- Screwings loose?

Remedy

- > Replace headrest.
- > Replace safety belt.
- > Replace individual parts.
- > Tighten screwings.

Disassembly

- Pull headrest (2) upwards from back module (1).



NOTE:

As a rule, when removing the headrests, the clamps located under the guide tubes must be removed first.

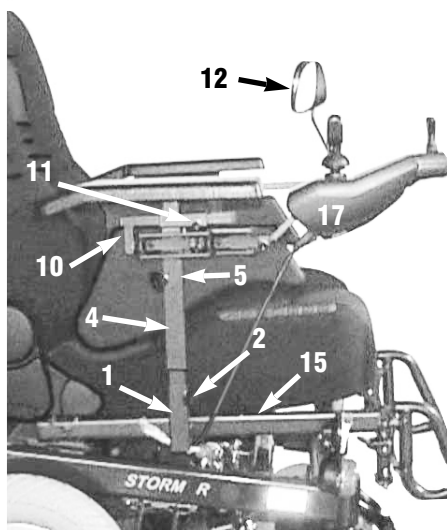
- Unscrew four screws located at the rear of the back module (1) and detach the safety belt (3).
- Release clamping lever (7) and detach push bar (5) with handle (6) from the holder (4).
- If necessary, pull handle (6) from the push bar (5).
- Unscrew four screws (8) with washers (9) completely and detach holder (4) from the back module (1).

Assembly

- Proceed with the assembly in reverse order.

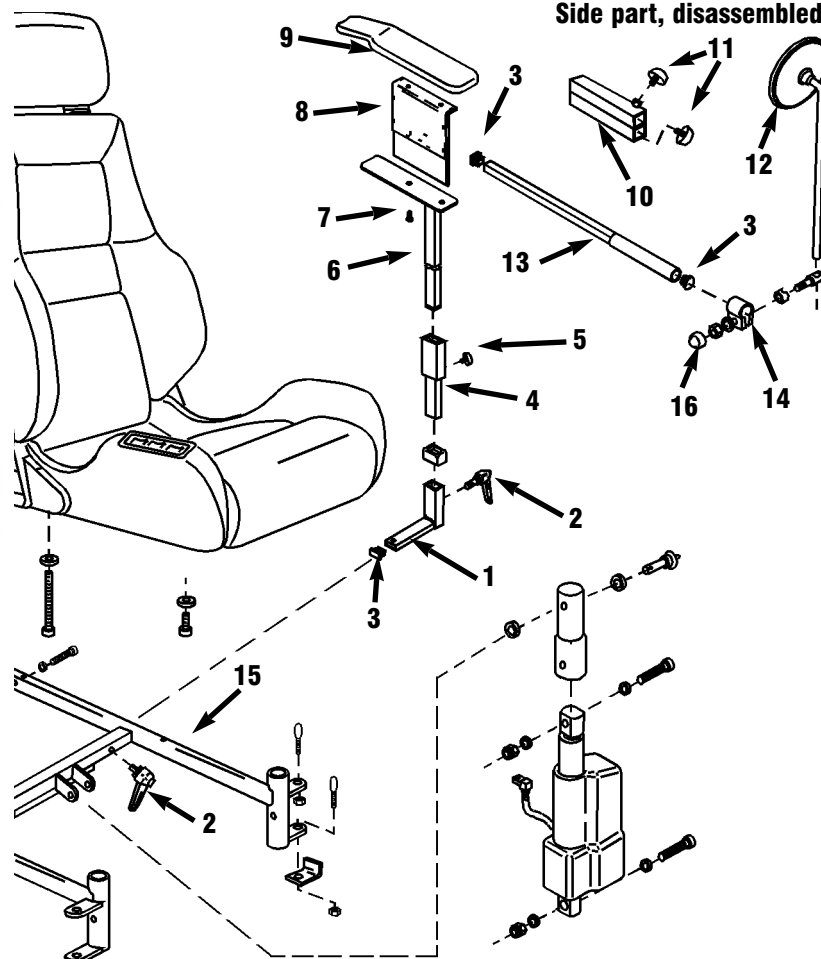
10.3 Armrests and side parts

Side parts, assembled



- 1 Armrest holder
- 2 Clamping lever
- 3 Slide piece
- 4 Armrest receptacle
- 5 Wing screw
- 6 Receiver of armrest pad
- 7 2x Screws
- 8 Side part pocket
- 9 Armrest pad
- 10 Adapter
- 11 Wing / Allen screws
- 12 Mirror
- 13 Mirror holder
- 15 Seat frame

Side part, disassembled



- 14 Clamp with clamping screw, washers and nut M6
- 16 Cap
- 17 Joystick box

Inspection

- Mirror damaged?
- Side part pocket damaged?
- Armrest padding damaged?
- Screwings loose?
- Slide pieces or caps damaged?
- Holders or receptacles damaged?

Remedy

- > Replace mirror.
- > Replace side part pocket.
- > Replace armrest pad.
- > Tighten screwings.
- > Replace slide parts or caps.
- > Replace individual parts.

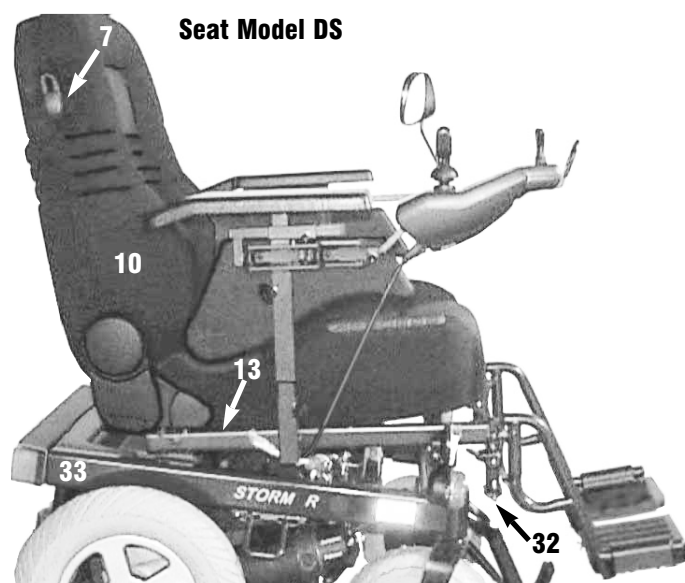
Disassembly, complete

- Detach connection plug, unscrew wing or Allen screws (11) and detach joystick box (17) plus mirror (12) with holder (13) from the adapters (10).
- If necessary, detach cap (16), loosen nut M6 completely and detach mirror (12) with fastener, clamping screw and washers (14) from the mirror holder (13).
- Loosen wing screw (5) and clamping lever (2) and detach receptacle (6) with pocket (8) and pad (9) plus receptacle (4) completely from the holder (1).
- If necessary, loosen screws (7) and separate pad (9) with pocket (8) from the receptacle (6).
- Loosen wing screw (2) below at seat frame (15) and remove armrest holder (1) from the seat frame (15).
- If necessary, replace slide pieces (3).

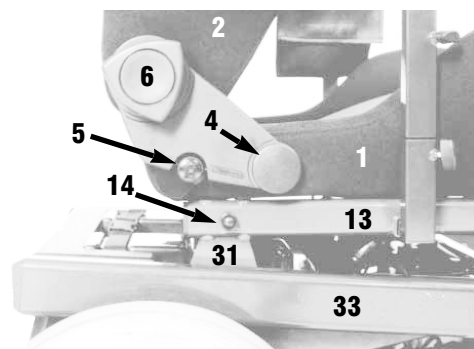
Assembly

- The assembly is performed in reverse order.

10.4 Seat module and seat frame

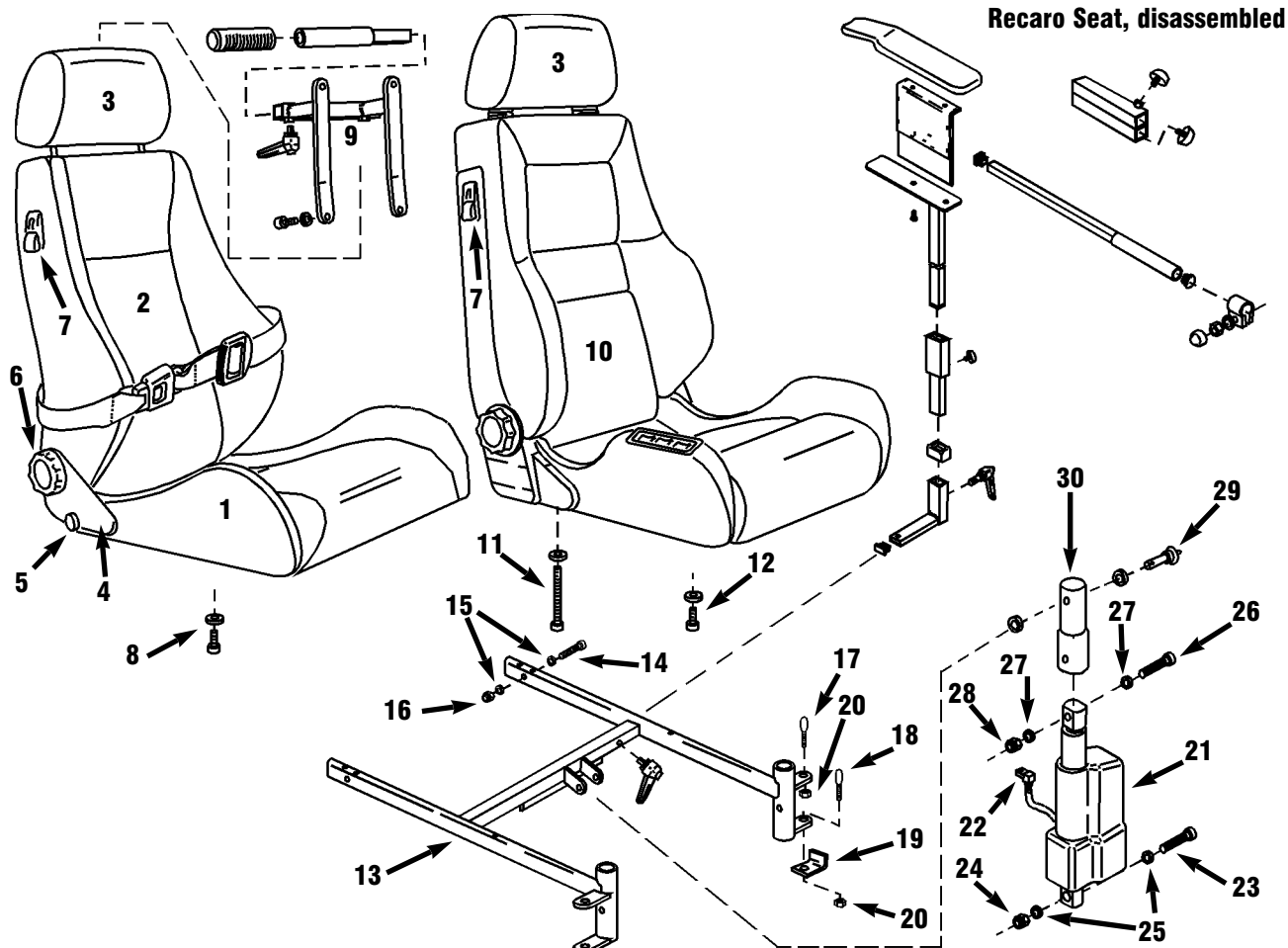


Seat Module LX,



NOTE:

For the seat recline adjustment, also a manual adjustment device can be mounted.



- 1 Seat module LX
- 2 Back module LX
- 3 Headrest LX or DS
- 4 Back module attachment
- 5 Stopper
- 6 Recline adjustment
- 7 Reclining mechanism
- 8 4x Screws with washers
- 9 Push handle, disassembled
- 10 Seat model DS with control
- 11 Screws / washers, rear
- 12 Screws / washers, front
- 13 Seat frame

- 14 2x Screws M8x50
- 15 2x Washer 16x8,3x1,5
- 16 2x Lock nut M8
- 17 2x Hinge bolt 7,8x30
- 18 2x Hinge bolt 7,8x35
- 19 2x Stopper
- 20 4x Lock nut M6
- 21 Actuator
- 22 Connection plug
- 23 Hexagonal head screw M10x50
- 24 Nut M10 Stop
- 25 2x Washer 19,5x10,2x2
- 26 Hexagonal head screw M8x45

- 27 2x Washer 16x8,4x1,5
- 28 Lock nut M8
- 29 Quick release bolt
- 30 Connecting rod top
- 31 Mounting plate
- 32 Legrest receptacle
- 33 Chassis

Inspection

- Padding damaged?
- Adjustment functions for Recaro seat module (electrical or manual) defective?
- Legrest locking tight or defective?
- Hinge bolt damaged?
- Actuator, cable or plug defective?
- Seat recline adjustment damaged?
- Screwings loose?
- Mounting plate damaged?
- Weldment joints at frame or frame damaged?

Remedy

- > Replace Recaro seat.
- > Check voltage converter, see chapter 16.6. If necessary, replace Recaro seat.
- > Smoothen locking device or replace.
- > Replace hinge bolt.
- > Test / replace motor. See chapter 14.0.
- > Repair / replace recline adjustment.
- > Tighten screwings.
- > Replace mounting plate.
- > Weld or replace frame.



NOTE:

For maintenance and repair work on the chassis (33) or on the seating system itself, the Recaro seat can be separated entirely from the chassis as follows:

- Detach joystick box and brake lever, if existing, from the side parts.
- If necessary, detach the electrical connections for the actuators (legrest adjustment).
- Remove legrests.
- Free connection cable from the clamping pieces (under the seat).
- Remove the quick-release bolt (29) of the seat recline adjustment (not shown) or from the actuator (21).
- Place the Recaro seat forward on top of the chassis (33).
- Detach nuts (16) at the upper part of the mounting plate (31) completely and separate with washers (15) from the screws (14).
- Support Recaro seat, remove screws (14) with washers (15) and lift the Recaro seat completely from the chassis (33).

Disassembly, legrest receptacle complete

- If necessary, detach the electrical connections of the actuators (legrest).
- Release legrest lock and detach legrests.
- Use a suitable sleeve, such as a strip of leather, and hold the locking bolt with a pair of tongs.
- Loosen nut (M5) completely and detach, together with bolt, spring and locking lever, from the seat frame (13).
- Remove plastic discs from the hinge bolts (17 and 18).
- Use a suitable sleeve, such as a strip of leather, and hold hinge bolts (17 and 18) with a pair of tongs.
- Loosen nuts (20) completely and detach hinge bolts (17 and 18), if appropriate, together with stopper (19), from the seat frame (13).

Montage

- The assembly is performed in reverse order.

Disassembly, seat recline adjustment complete

- **Only for electrical legrest adjustment:** Remove connection plug from the sockets (front, below) at the battery box retainer.
- Release legrest lock and detach legrests.
- Release quick-release bolt (29) at the upper part of the seat recline adjustment device (not shown) or at actuator (21), and remove, if appropriate, together with washers.
- **Only for actuator:** Remove connection plug from the socket (front, below) at the battery box retainer.
- Loosen nut (24) completely and remove together with washer (25) from the screw (23).
- Support actuator (21) or seat recline adjustment with your hand, remove screw (23) together with washer (25) and detach actuator (21) or seat recline adjustment device from the seat frame (13).
- **Only for actuator:** Loosen nut (28) at connecting rod and detach together with washer (27). Detach screw (26) together with washer (27) and remove the top of connecting rod (30) from the connecting rod of the actuator.
- **Only for manual adjustment:** Rotate threaded out of the adjustment device. If required, press bushing out of the threaded rod.

Assembly

- The assembly is performed in reverse order.

Disassembly, Seat Module and Seat Frame complete

- If necessary, remove headrest. See chapter 10.2 in this respect.
- Detach joystick box and, if existing, brake lever from the side parts.
- Detach side parts from the seat frame (13). See chapter 10.3 in this respect.
- If necessary, detach the connection cable of the actuators and remove the cable clamps from the connection cable.
- Release legrest lock and remove legrests.
- Release the quick-release bolt (29) of the seat recline adjustment (not shown) or of the actuator (21) respectively, and place the Recaro seat forward on top of the chassis (33).
- Loosen nut (16) at the upper part of the mounting plate (31) completely and detach together with washers (15) from the screws (14).
- Support Recaro seat, remove screws (14) with washers (15) and remove the Recaro seat completely from the chassis (33).
- Place the Recaro seat on its side and remove screws (8) or (11 and 12) completely.
- Separate seat frame (13) from the Recaro seat.
- If necessary, remove clamping lever.
- If necessary, loosen two screws M8x20 with washers (not shown) at lower part of the mounting plate (31) completely, and detach the mounting plate from the chassis (33).

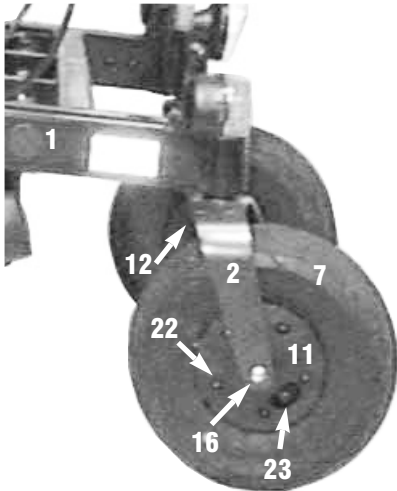
Assembly

- The assembly is performed in reverse order.

11.0 Check and Repair Work on the Chassis

11.1 Front wheel suspension and wheels 3.00-4"

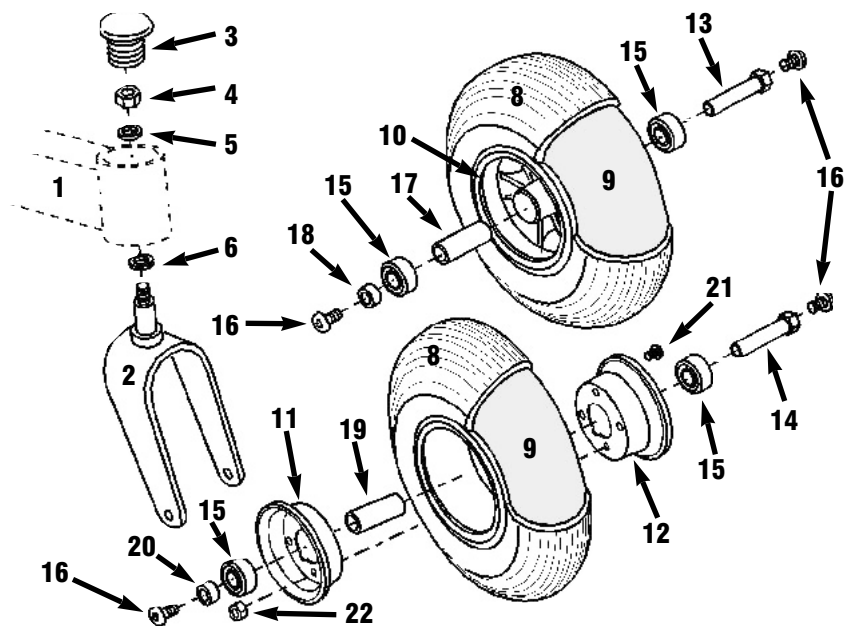
Front wheels, assembled



NOTE:

The front wheels can be equipped with 1-piece or 2-piece rims.

Front wheels, disassembled



- 1 Chassis
- 4 Hexag. head locknut M12x1,5
- 7 Front wheel
- 10 Plastic rim 4", one-piece
- 13 Axle bolt for one-piece rim
- 16 2x Screw M8x16
- 19 Bushing 15x1,2x59,1
- 22 5x Hexagon head cap lock nut M6

- 2 Front wheel fork f/wheel 3.00-4"
- 5 Washer 13x24x2,5
- 8 Tyre, outer cover 260x85
- 11 Rim part 1
- 14 Axle bolt for 2-piece rim
- 17 Bushing 16x1,75x51,2
- 20 Bushing 16x2x12,5
- 23 Valve cap

- 3 Slide piece DA=42
- 6 Adjusting washer 16x22x1,0
- 9 Inner tube 260x85
- 12 Rim part 2
- 15 2x Ball bearing 6001
- 18 Bushing 16x1,75x19
- 21 5x Cheese head screw M6x60

Inspection

- Wheel losing air?
- Tyre damaged?
- Rim damaged?
- Screws loose?
- Wheel bearing tight or worn out?
- Front wheel tight or too loose?
- Front wheel fork damaged?

Remedy

- > Repair or replace tube.
- > Replace tyre.
- > Replace rim.
- > Tighten screws.
- > Adjust or replace wheel bearing.
- > Adjust / clean slide bearing or replace fork if necessary.
- > Replace fork.

Disassembly, Front Wheels

- Use suitable support (e.g. wooden block) and jack up wheelchair.
- Hold axle bolt (13 or 14) with a jaw spanner (SW 13) and loosen 2 screws (16) completely.
- Pull out axle bolt (13 or 14) and detach together with bushing (18 or 20) from the front wheel (7).
- Remove front wheel (7) from the fork (2).

Assembly

- The assembly is performed in reverse order.



CAUTION:

- *The screws (16) were mounted at the factory with Plasbolt. They can be dismantled / mounted up to 6 times. At the 7th time, at the latest, the screws must be cleaned and then reinserted with Loctite*
- In 2-piece rims, make sure before inserting the axle bolts (14) that the bushing (19) is correctly centered.

Disassembly, 1-piece Rims and Tyres

- Remove the front wheel (7) completely. See in this respect Disassembly / Assembly Front Wheels.
- Remove valve cap (23) and deflate tyre completely by pressing the spring pin of the valve.
- Pull off outer cover (8) sideways from the rim (10) by means of a tyre-puller.
- Remove inner tube (9) from the outer cover (8) and from the rim (10).
- If necessary, repair inner tube or replace inner tube (size 260x85).
- Detach outer cover (8) completely from the rim (10).
- If necessary, press wheel bearing (15) out and bushing (17).

Assembly

- Press first wheel bearing (15) into the rim (10) until it closes even with the rim.
- Insert bushing (17) into the rim (10).
- Press second wheel bearing (15) into the rim (10) until it closes even with the rim.
- Mount outer cover (8) sideways onto the rim (10).
- Insert inner tube (9) correctly and inflate until the inner tube has taken the shape of a ring.
- Mount outer cover (8) carefully and completely on the rim (10) and check for correct fit.
- Inflate tyre up to the prescribed air pressure of 2.5 bar and screw on valve cap (23)
- Then mount wheel (7) into the front wheel fork (2). See in this respect Disassembly / Assembly Front Wheels.

Disassembly, 2-piece rims and tyres

- Remove front wheel (7) completely. See in this respect Disassembly / Assembly Front Wheels.
- Remove valve cap (23) and deflate tyre by pressing the spring pin of the valve.
- Unscrew 5 cheese-head screws (21) cross wise and detach from rims (11 and 12).
- Press rim halves (11 and 12) carefully from the outer cover (8) with the aid of a tyre lever.
- Remove bushing (19) and then take the inner tube (9) out of the outer cover (8).
- If necessary, repair inner tube or replace by inner tube (size 260x85).
- If necessary, press cap stop nuts (22) out of the rim half (11).
- If necessary, remove wheel bearings (15) from the rim halves (11 and 12).

Assembly

- Press wheel bearings (15) into the rim halves (11 and 12) up to the point, where they are level with the rim.
- Press cap lock nuts (22) into the rim half (11).
- Mount outer cover (8) first onto the rim half (11).
- Insert the inner tube (9) in such a way, that the valve fits correctly into the bore hole of the rim half (11).
- Inflate inner tube (9) only up to the point, where it has taken the shape of a ring.
- Insert bushing (19) and press rim half (12) carefully into the outer cover (8) in such a way, that the cutout is located over the valve.
- Insert cheese head screws (21) and tighten cross wise.
- Inflate tyre to the prescribed pressure of 2.5 bar und screw on valve cap (23).
- Then mount wheel (7) into the front wheel fork (2). See in this respect Disassembly / Assembly Front Wheels.

Disassembly,

- Remove front wheel (7) completely. See in this respect Disassembly / Assembly Front Wheels.
- Loosen slide piece (3) for example with a screwdriver, and detach.
- Hold front wheel fork (2), loosen nut (4) completely and detach together with washer (5).
- Remove front wheel fork (2) with adjusting washer (6) from the slide bearing downward in the chassis (1).

Assembly

- The assembly is performed in reverse order.

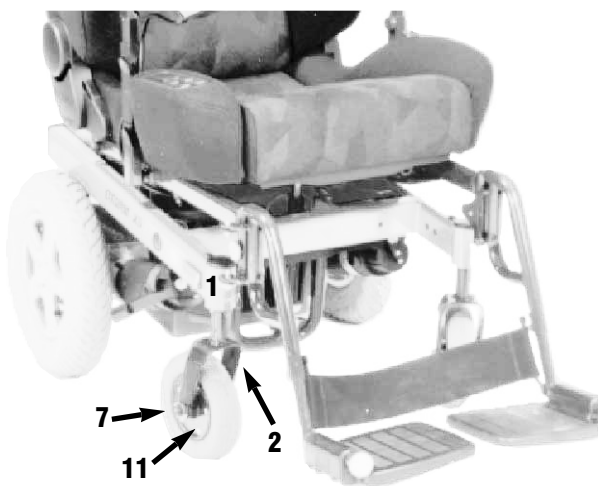


CAUTION:

- *The front wheel forks rest on slide bearings, which give way after the first operating hours and must be tightened*
- *Check and tighten nut (4) after 5 operating hours and once again after another 10 hours.*
- *The nut (4) must be tightened to a degree where the forks turn freely without any vertical play.*

11.2 Front Wheel Suspension and 200x50 Wheels

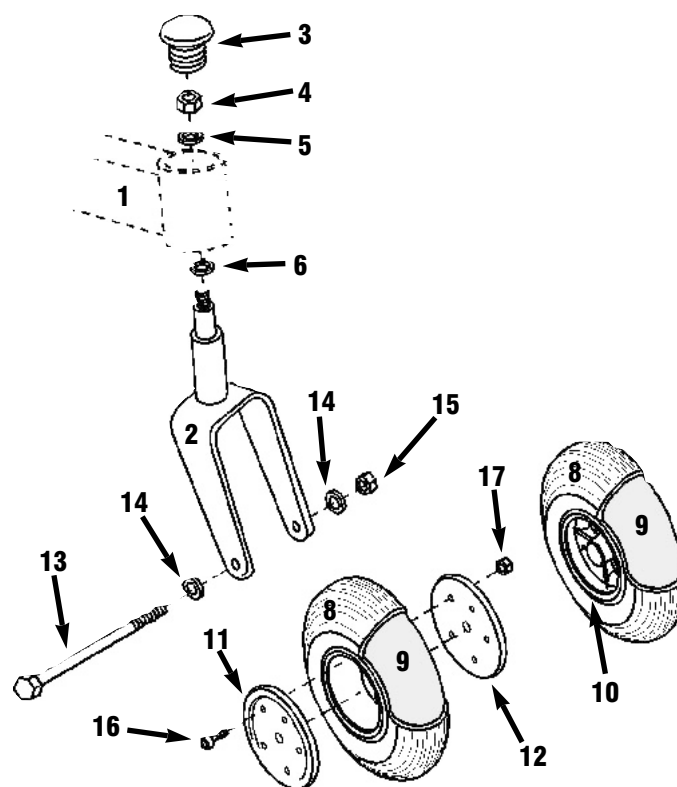
Front wheels, assembled



NOTE:

The front wheels can be equipped with 1-piece or 2-piece rims.

Front wheels, disassembled



- 1 Chassis
- 4 Hex. head nut M12x1,5 Stop
- 7 Front wheel
- 10 Rim 4", one-piece
- 13 Hex. head screw M8x50
- 16 5x Screw M6x50

- 2 Front wheel fork f.wheel 200x50
- 5 Washer 13x24x2,5
- 8 Outer cover 200x50
- 11 Rim part 1
- 14 2x Washer 8,4x17x1,6
- 15 Lock nut M8
- 3 Slide piece DA=42
- 6 Adjusting washer 16x22x1,0
- 9 Inner tube 200x50
- 12 Rim part 2
- 17 5x Lock nut M6

Inspection

- Wheel losing air?
- Outer cover damaged?
- Rim damaged?
- Screws loose?
- Wheel bearing tight or worn out?
- Front wheel fork tight or too slack?
- Front wheel fork damaged?

Remedy

- > Repair or replace inner tube.
- > Replace outer cover.
- > Replace rim.
- > Tighten screws.
- > Adjust or replace wheel bearing.
- > Adjust / clean slide bearing / or replace fork.
- > Replace fork.

Disassembly, front wheels

- Use suitable support (e.g. wooden block) and jack up wheelchair.
- Loosen nut (15) completely and detach together with washer (14) from the screw (13).
- Pull out screw (13) and detach together with washer (14) from the front wheel (7).
- Remove front wheel (7) from the fork (2).

Assembly

- The assembly is performed in reverse order.

Disassembly, 1-piece rims and tyres

- Remove front wheel (7) completely. See in this respect Disassembly / Assembly Front Wheels.
- Remove valve cap (not shown) and deflate tyre by pressing on the spring pin of the valve.
- Pull outer cover (8) sideways from the rim(10) with the aid of a tyre puller.
- Remove inner tube (9) from the outer cover (8) and from the rim (10).
- If required, repair inner tube or replace inner tube (size 200x50).
- Detach outer cover (8) completely from the rim (10)
- If required, press out wheel bearing and remove.

Assembly

- Press first wheel bearing into the rim (10) to a point where it is level with the rim.
- Press second wheel bearing into the rim (10) to a point where it is level with the rim.
- Mount outer cover (8) sideways on the rim (10).
- Insert inner tube (9) correctly and inflate only to a point where the inner tube has taken the shape of a ring.
- Mount outer cover (8) carefully and completely onto the rim (10) and check for correct fit.
- Inflate tyre to the prescribed pressure of 2.5 bar and screw on valve cap.
- Then mount wheel (7) into the front wheel fork (2). See in this respect Disassembly / Assembly Front Wheels.

Disassembly, 2-piece rims and tyres

- Remove front wheel (7) completely. See in this respect Disassembly / Assembly Front Wheels
- Remove valve cap (not shown) and deflate tyre by pressing the spring pin of the valve.
- Loosen 5 screws (16) and nuts (17) cross wise and detach.
- Press rim halves (11 and 12) carefully from the outer cover with the aid of a wheel lever.
- Take inner tube (9) out of the outer cover (8).
- If required, repair inner tube or replace by inner tube (size 200x50).
- If required, press wheel bearings out of the rim halves (11 and 12).

Assembly

- Press wheel bearings (11 and 12) into the rim halves up to a point where they are level with the rim.
- Mount outer cover (8) first on rim (11).
- Insert inner tube (9) in such a way, that the valve is correctly located in the bore hole of the rim half (11).
- Inflate inner tube (9) only to a point, where it has taken the shape of a ring.
- Press rim half (12) carefully into the outer cover (8) in such a way, that the cutout is located over the valve.
- Insert screws (16) and nuts (17) and tighten cross wise.
- Inflate tyre to the prescribe pressure of 2.5 bar and screw on valve cap.
- Then mount wheel (7) into the front wheel fork (2). See in this respect Disassembly / Assembly Front Wheels.

Disassembly, front wheel forks

- Remove front wheel (7) completely. See in this respect Disassembly / Assembly Front Wheels.
- Loosen slide piece (3), for example with a screwdriver, and detach.
- Hold front wheel fork (2), loosen nut (4) completely and detach with washer (5).
- Remove front wheel fork (2) with adjusting washer (6) downwards out of the slide bearing in the chassis (1).

Assembly

- The assembly is performed in the reverse order.

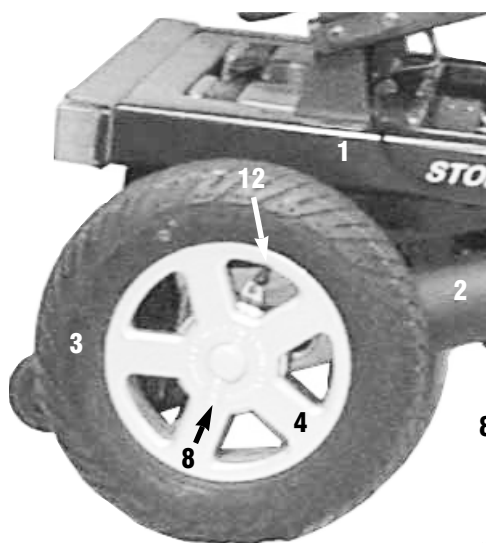


CAUTION:

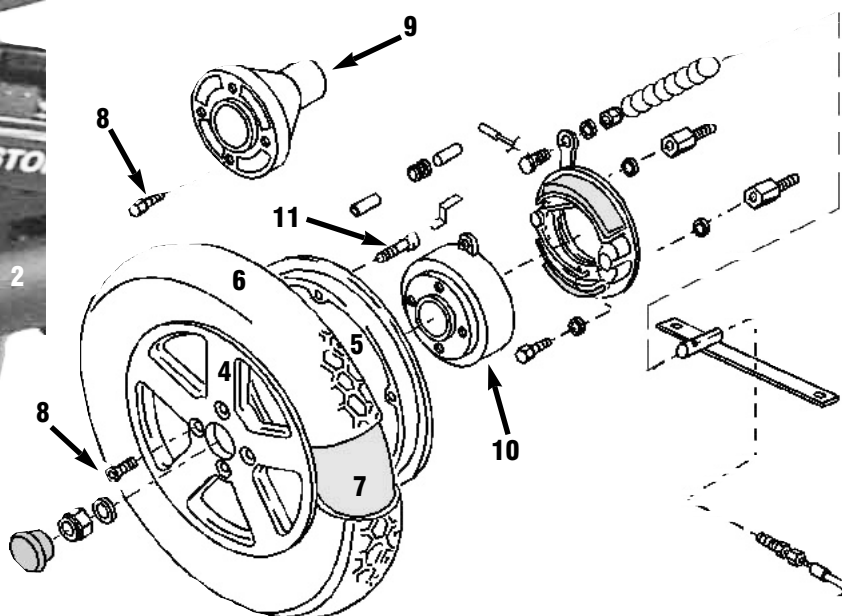
- Check and tighten nut (4) after 5 operating hours and once again after another 10 hours.
- The nut (4) must be tightened to a degree where the forks turn freely without any vertical play.

11.3 Rear wheels and tyres

Rear wheels, assembled



Rear wheel, disassembled



- | | | |
|--------------------------------|---------------------------------|-----------------------|
| 1 Chassis | 2 Drive, complete | 3 Rear wheel 3.00-8" |
| 4 Rim 1,5x8 (rim body outside) | 5 Rim 1,5x8 (rim body inside) | 6 Outer cover 3.00-8" |
| 7 Inner tube 3.00-8" | 8 4x Countersunk screw M8x20 PB | 9 Wheel hub, standard |
| 10 Wheel hub with brake drum | 11 5x Allen screw M6x35 | 12 Valve cap |

Inspection

- Tyre losing air?

Remedy

- > Repair or replace inner tube.
- > Check outer cover for foreign bodies.
- > Replace outer cover.
- > Tighten screws.
- > Replace rims.



NOTE:

- The rear wheels can be mounted on standard hubs or on hubs with brake drum.
- The disassembly is identical in both instances.
- It is recommended to remove the batteries before the disassembly to reduce the wheelchair's weight.

Disassembly, complete

- Loosen countersunk screws (8) cross wise.
- Jack up wheelchair to clear the wheel.
- Unscrew countersunk screws (8) completely and detach the wheel (3).
- Deflate the wheel, loosen Allen screws (11) cross wise and remove.
- Take apart rim bodies (4 and 5).
- Withdraw the inner tube (7) from the outer cover (6).
- Repair inner tube or replace by new inner tube (size 3.00-8").

Assembly

- Inflate inner tube slightly until it takes the shape of a ring (7).
- Insert inner tube (7) into the outer cover (6) and place the two rim halves into the cover from outside.
- Insert Allen screws (11, screw down cross wise and tighten by means of a torque wrench (25 to 30 Nm).
- Inflate tyre to the filling pressure of 2.5 bar and screw on valve cap (12).
- Place wheel (3) on hub (9 and 10, respectively), insert countersunk screws (8) and tighten cross wise.



CAUTION:

- The countersunk screws (8) are not allowed to be lubricated under any circumstances.
- The screws are inserted at the factory with Plasbolt. They can be dismounted / mounted up to 6 times.
- In the 7th mounting, at the latest, the screws must be cleaned and then inserted with Loctite.
- Tighten screws only hand-tight, do not overturn.

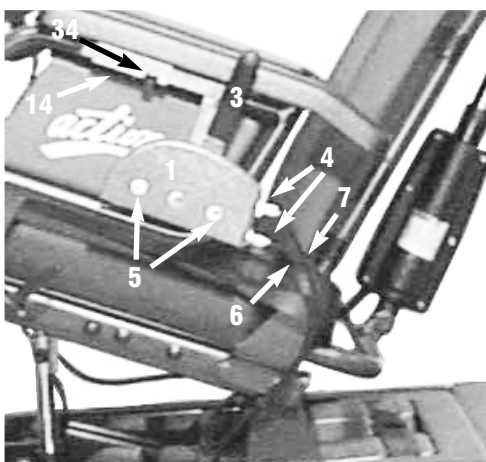


CAUTION:

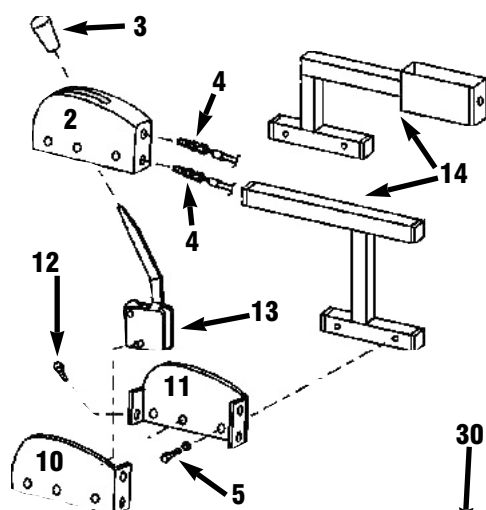
- The cutouts of the rim halves must embrace the valve.
- Make sure that the inner tube does not get pinched between the rim halves.

11.4 Parking Brake and Wheel Hubs

Brake lever, assembled

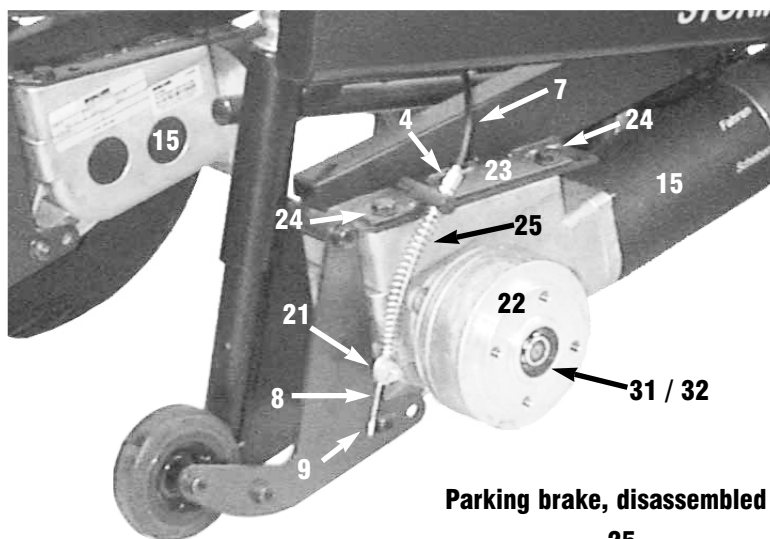


Brake lever, disassembled

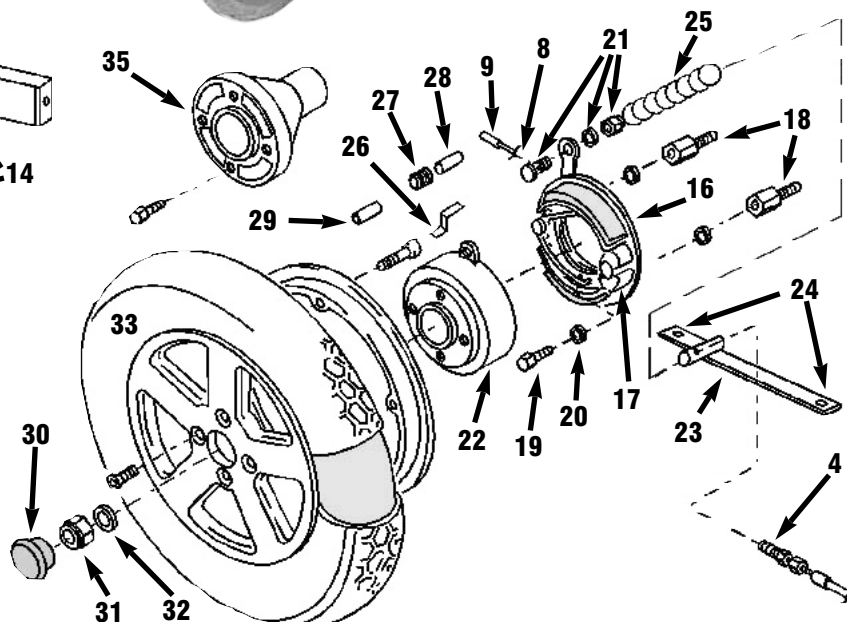


- 1 Brake lever, complete
- 2 Cover for brake housing
- 3 Plastic knob
- 4 4x Adjusting screw M6x24
- 7 Bowden wire covering 830 mm
- 10 Brake housing half 1
- 11 Brake housing half 2
- 12 2x Countersunk screw M6x10
- 13 Brake lever
- 14 Brake holder part 2
- 16 Brake backing plate, cpl. LH + RH
- 17 Brake lining set cpl. w/spring
- 19 4x Screw M6x10
- 22 Wheel hub with brake drum
- 25 Compression spring LO = 110
- 28 Round magnet
- 31 Lock nut M12x1,5
- 34 Wing or Allen screw

Parking brake, assembled



Parking brake, disassembled



- 5 2x Tapping screw 4,8x16
- 8 Inner brake cable 2000 mm
- 9 2x Cap
- 15 2x Drive unit
- 18 4x Hexagon receiving unit
- 21 2x Cable locking screw M6
- 24 Screw M6x30 and washer
- 27 Bushing
- 30 Slide piece SL 35
- 33 Rear wheel, cpl.
- 35 Wheel hub, standard

Inspection

- Brake pulling to one side or not reacting?
- Bowden cable or Bowden cable cover damaged?
- Brake housing or brake lever damaged?
- Screws loose?
- Brake tight?
- Brake linings worn out / defective?
- Backing plate or mounting parts damaged?

Remedy

- Adjust brake, replace brake linings.
- Replace parts.
- Replace parts.
- Tighten screws.
- Check brake drum, linings; replace, if necessary.
- Replace brake linings.
- Replace parts.

Disassembly Bowden Cable, complete

- Lift seating system and lock, if required.
- Remove rear wheels (33). See chapter 11.3 in this respect.
- Release brake and write down the positions of the adjusting screws (4) at the upper side of the brake lever (1) and on the Bowden cable holders (23).
- Loosen cable locking screws (21) and, if necessary, detach completely together with nut and washer.
- Squeeze off caps (9), pull inner brake cable (8) out of the cable locking screws (21) and remove compression springs (25).
- Pull inner brake cable (8) together with the Bowden cable coverings (6 and 7) out of the adjusting screws (4) located at the lower part of the Bowden cable holders (23).
- Remove cable binders (not shown) from the Bowden cable coverings (6 and 7) and uncover both Bowden cable ends upwards toward the brake lever (1).
- Pull off Bowden cable coverings (6 and 7).
- Loosen wing or Allen screws (34) and detach the parking brake completely with brake housing holder (14).
- Remove Bowden cable coverings (6 and 7) from the inner brake cable (8).
- Pull inner brake cable (8) out of the brake housing (10 and 11) and detach from the brake lever (13).



NOTE:

- It is recommended to remove the batteries before disassembling, in order to reduce the weight of the wheelchair.
- The wheelchair is to be jacked up.

Assembly

- Place inner brake cable (8) over the brake lever (13) in the brake housing (10 and 11) and pull through the adjusting screws (4) in such a way that the free length to the left rear wheel amounts to approx. 700 mm and to the right rear wheel to approx 1000 mm.
- Pull Bowden cable covering (6) over the inner brake cable (8) until it ends level with the adjusting screw (4) at the brake housing (10 and 11).
- Pull Bowden cable covering (7) over the inner brake cable (8) until it ends level with the adjusting screw (4) at the brake housing (10 and 11).
- Mount brake housing with brake housing holder (14) to the armrest.
- Pull inner brake cable (8) through the adjusting screws (4) at the lower part of the Bowden cable holders (23) in such a way, that the coverings (6 and 7) end level with the adjusting screws.
- Attach compression springs (25), pull inner brake cable (8) through the cable locking screws (21) and for the present tighten both locking screws.
- Squeeze caps (9) onto both ends of the inner brake cable (8).

Adjusting the brakes

- Loosen locking screws (21) slightly, on each side one after the other, and pull inner brake cable up to the point where the distance between the locking screw (21) and the adjusting screw (4) at the Bowden cable holder (23) amounts to approx. 85 mm.
- Fasten the inner brake cable (8) with the locking screw (21).
- Disengage motor and check, while the brake is being released, whether the wheel hubs (22) turn freely.
- Turn wheel hubs (22) slowly one after the other on each side while simultaneously pulling the brake lever (1) steadily until the hub is slowed down.



NOTE:

- Up to the point of slowing down, both hubs must have made approximately the same rotation.
- If necessary, adjust brakes to a uniform pull by adjusting the inner brake cable (8), or by means of the adjusting screws (4).
- Mount rear wheels (33). See in this respect chapter 11.3.
- Make wheelchair ready to start.

Disassembly brake housing with brake lever, complete.

- Disassemble Bowden cable completely. See disassembly Bowden cable.
- Loosen counter nuts and remove adjusting screws (4) at brake housing (10 and 11).
- Loosen tapping screws (5) completely and detach brake housing from its holder (14).
- Pull off knob (3) from brake lever (13) and remove cover (2) from the brake housing (10 and 11)
- Loosen screws (12) completely, take apart the brake housing parts (10 and 11) and remove the brake lever (13).

Assembly

- The assembly is performed in the reverse order.
- For the assembly of the Bowden cable see Assembly Bowden cable.
- For the adjustment of the brakes see Adjusting Brakes.

Disassembly Wheel Hub with Brake Drum, complete

- Remove rear wheel (33). See in this respect chapter 11.3.
- Remove slide piece (30), loosen nut (31) completely and detach together with washer (32).
- Remove wheel hub (22) with brake drum from axle.
- Remove spring from the brake linings with a pair of tongs.
- Hold up bolt (not shown), loosen nut M8 (not shown) completely and detach brake lining set (17) completely from the brake backing plate (16).
- If necessary, squeeze off cap (9) from the inner brake cable (8) and loosen cable locking screw (21).
- Pull inner brake cable (8) out of the locking screw (21) and detach compression spring (25).
- Loosen screws (19) with washers (20) completely and detach brake backing plate (16) from the hexagon receiving unit (2x 18).
- If necessary, screw hexagon receiving unit (18) out of the drive unit.



CAUTION:

- *A feather key is inserted in the axle. Do not lose.*

Montage

- The assembly is performed in the reverse order.
- For the assembly of the inner brake cable, see Assembly Bowden cable.
- For the adjustment of the brakes, see Adjust Brakes.



NOTE:

- For wheel hubs without brake drums (35) the steps for the components of the parking brake do not apply.
- In wheelchairs with speed indicators, the retaining plate (26), bushing (27), the round magnet (28) and bushing (29) might have to be dismantled, too.

Disassembly Bowden cable holder, completely

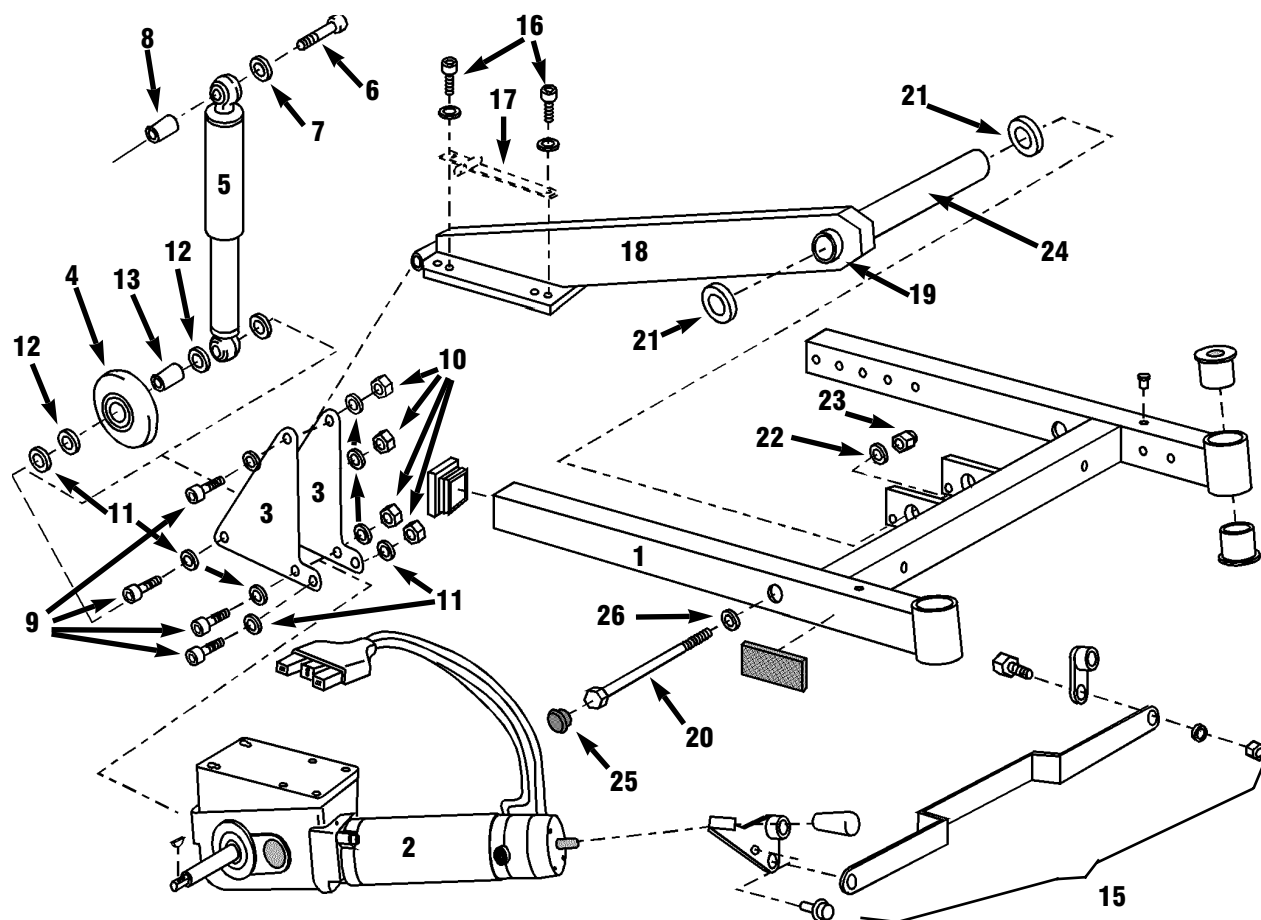
- Remove rear wheel (33). See in this respect chapter 11.3.
- Squeeze off cap (9) from the inner brake cable (8) and loosen cable locking screw (21).
- Pull inner brake cable (8) from the locking screw (21) and detach compression spring (25).
- Remove inner brake cable (8) with covering (6) from the adjusting screw (4).
- Loosen counter nut and remove the adjusting screw (4) from the Bowden cable holder (23).
- Support the drive unit (15), loosen screws with washers (24) completely and detach Bowden cable holder (23) from the drive unit.

Assembly

- The assembly is performed in reverse order.
- For the assembly of the inner brake cable see Assembly Bowden cable.
- For the adjustment of the brakes see Adjusting Brakes.

11.5 Wheel Suspension in the Rear with Shock Absorbers, Support Castors, Support Plates and Rear Wheel Link

Wheel suspension, disassembled



- | | | |
|-------------------------------|-------------------------------|----------------------------|
| 1 Chassis | 2 Drive unit, complete | 3 Support plate, short |
| 4 Support castor | 5 Shock absorber | 6 Screw M8x50 |
| 7 Washer 8,4x25x2 | 8 Bushing RD 22x12, ALU | 9 4x Screw M8x75 |
| 10 4x Lock nut M8 | 11 11x Washer 8,4 | 12 Bushing RD 10x0,95x31,5 |
| 13 Bushing RD 12x1,8x18 | 14 Rear reflector (not shown) | 15 Disengaging mechanism |
| 16 4x Screw M6x30 with washer | 17 Bowden cable holder | 18 Rear wheel link |
| 19 Metal link bushing | 20 Screw M12x160 | 21 Support disc RD 25x4 |
| 22 Bushing RD 19x18 | 23 Nut M12 Stop | 24 Bushing RD 18x2,5x49,4 |
| 25 Stopper POP 1093 | 26 Washer | |

Inspection

- Support wheel damaged?
- Support plate deformed / damaged?
- Shock absorber too soft / damaged?
- Screws loose?
- Rear reflector damaged?
- Rear wheel link damaged?

Remedy

- > Replace support wheel.
- > Straighten or replace support plate.
- > Replace shock absorber.
- > Tighten screws.
- > Replace rear reflector.
- > Replace rear wheel link.

Disassembly support wheels

- Remove rear battery box.
- Loosen completely screw (9) and nut (10) at lower part of the support plate (3).
- Remove support castor (4) completely with bushings (12 and 13) plus washers (11) from the support plates (3).

Montage

- The disassembly is performed reverse order.



NOTE:

- The support plates (3) are available in 2 versions (long and short).

Disassembly support plates

- Remove rear battery box and jack up wheelchair, if appropriate.
- If required, remove rear wheel. See chapter 11.3 in this respect.
- Loosen screw (9) and nut (10) at the lower part of the support plate (3) completely.
- Remove support castor (4) completely with bushings (12 and 13) and washers (11) from the support plates (3).
- Loosen all screws (9) completely and remove together with nuts (10) and washers (11).
- Detach support plates (3) from the chassis (1) and from the shock absorber (5).

Assembly

- The assembly is performed in the reverse order.

Disassembly shock absorber

- Remove rear battery box and jack up wheelchair, if appropriate.
- If required, remove rear wheel. See chapter 11.3 in this respect.
- Loosen nut (10) at the lower part of the shock absorber (5) completely and remove together with washer (11).
- Loosen screw (6) at the upper part of the shock absorber completely and remove together with washer (7) and bushing (8).
- Detach shock absorber (5) from the chassis (1) and from the support plate (3).
- Remove rear reflector with holder from the shock absorber (5).

Assembly

- The assembly is performed in reverse order.



NOTE:

- The shock absorbers are distinguished by versions 1500 Nm (up to 75 kgs user's weight) and 2300 Nm (over 75 kgs user's weight).
- The rear reflectors are glued.

Disassembly rear wheel link

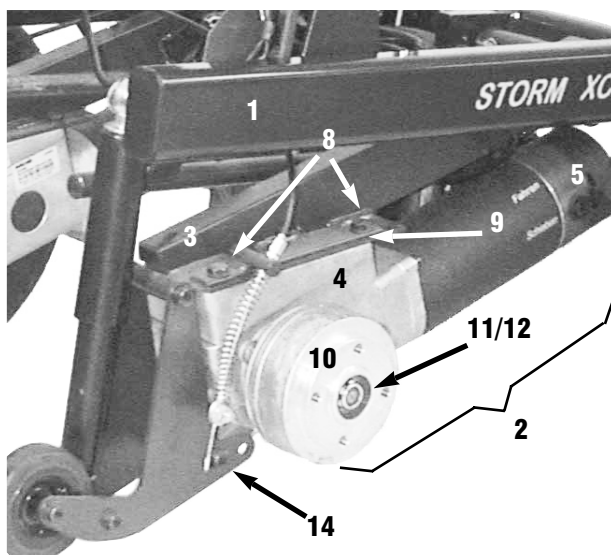
- Lift seating system and lock, if necessary, or detach seating system entirely from the chassis (1).
- Remove battery boxes and jack up wheelchair.
- If necessary, loosen screws, washers and nuts completely and remove disengaging mechanism (15) from the motor.
- Remove drive unit. See chapter 11.6 in this respect.
- Remove stopper (25).
- Loosen nut (23) completely and remove with bushings (21 and 22).
- Remove screw (20) with washer (26) and bushing (21).
- Detach rear wheel link (18) from the chassis (1).
- If necessary, remove bushings (19 and 24) from the link.

Assembly

- The assembly is performed in reverse order.

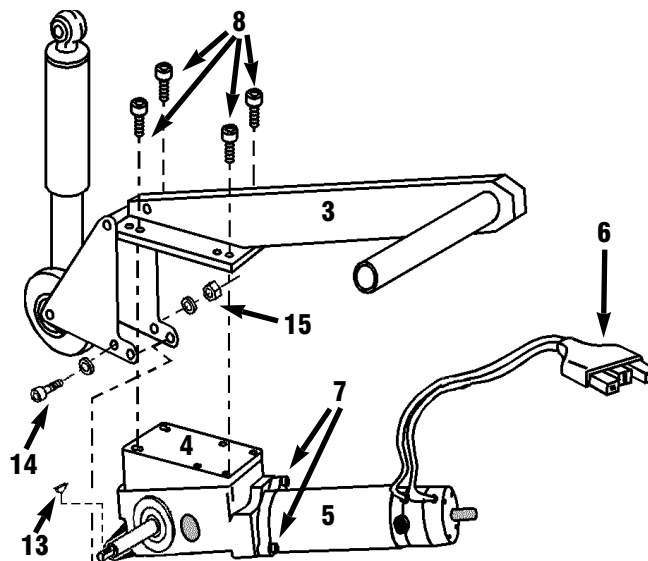
11.6 Driving Unit, complete

Driving unit, assembled



- 1 Chassis
- 4 Gear
- 7 2x Screw M6x30
- 10 Wheel hub
- 13 Feather key 6x6x40

Driving unit, disassembled



- 2 Driving unit, complete
- 3 Rear wheel link
- 4 Gear
- 5 Drive motor
- 6 Connection plug
- 7 2x Screw M6x30
- 8 4x Screw M6x30 and washer
- 9 Bowden cable holder
- 10 Wheel hub
- 11 Lock nut M12x1,5
- 12 Disc
- 13 Feather key 6x6x40
- 14 Screw M8x75 with washer
- 15 Lock nut M8 with washer

Inspection

- Gear tight?
- Gear noises?
- Driving unit defective?

Remedy

- > Replace gear.
- > Replace gear.
- > Replace driving unit.



NOTE:

- For motor inspections / checks, see chapter 13.0.

Disassembly driving unit

- Remove battery boxes, jack up wheelchair and support driving unit additionally.
- Lift seating system and lock, if necessary.
- Loosen two screws and remove splash protection of modules. See in this chapter 11.7 in this respect.
- Detach connection plug (6) from main module (not shown).
- If necessary, loosen screws, washers and nuts completely and remove disengaging mechanism (not shown) from motor.
- Loosen two screws (7) and detach drive motor (5) from the gear (4).
- Remove rear wheel. See chapter 11.3 in this respect.
- Loosen nut (11) completely, remove together with washer (12) and detach wheel hub (10).
- If required, detach brake backing plate (not shown) from the gear (4).
- Loosen nut (15) with washer (at lower part of support plate) completely and remove screw (14) and washer.
- Loosen screws (8) completely and detach gear (4) from the rear wheel link (3).

Assembly

- The assembly is performed in reverse order.

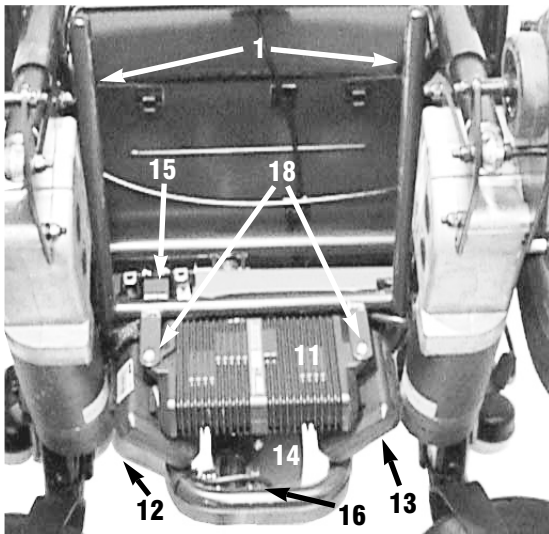


NOTE:

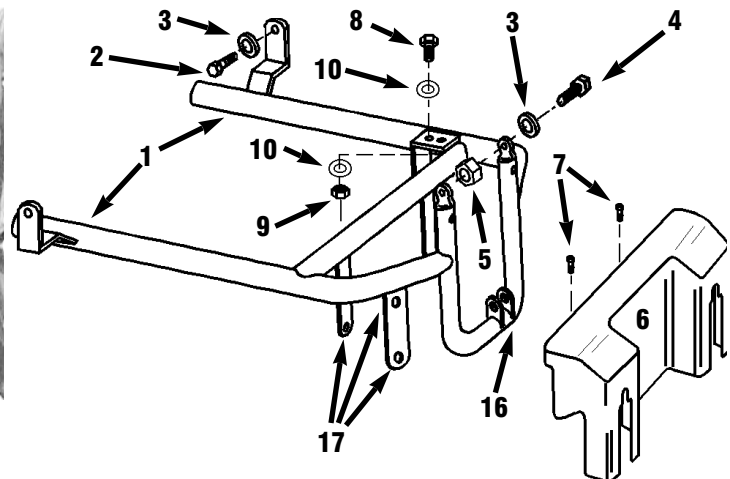
- When detaching the wheel hub (10,) do not lose the feather key (13).
- The Bowden cable holder (9) and the brake backing plate remain with the wheelchair.

11.7 Splash Protection for Modules and Battery Box Retainer

Battery box retainer, assembled



Battery box retainer, disassembled



- | | | |
|--|-----------------------------|----------------------------------|
| 1 Battery box retainer | 2 2x Screw M8x20 | 3 6x Washer 16x8,4x1,5 |
| 4 2x Screw M8x35 | 5 2x Nut M8 Stop | 6 Splash protection |
| 7 2x Tapping screw 3,8x10 | 8 2x Screw M3x27 | 9 2x Nut M3 Stop |
| 10 4x Washer 7x3,2x0,4 | 11 Main module | 12 Lighting module |
| 13 Lighting- / adjustment module | 14 Actuator (seat adjustm.) | 15 Connection socket with holder |
| 16 Screw M10x50 with washer and lock nut M10 | | 17 Bore holes for modules |
| 18 Screws M5x16 with washers and lock nuts nuts M5 | | |

Inspection

- Splash protection damaged?
- Screwings loose?
- Battery box retainer damaged?

Remedy

- > Replace splash protection.
- > Tighten screws.
- > Replace battery box retainer.

Disassembly splash protection

- Lift seating system and lock, if necessary.
- Loosen tapping screws (7) completely and detach splash protection (6) from the battery box retainer.

Assembly

- The assembly is performed in the reverse order.

Disassembly Battery Box Retainer

- Separate seating system from chassis and remove splash protection of the modules.
- Remove battery boxes.
- Detach the plug for the drive motors from the main module and, if necessary, detach the plugs of actuators and lighting from the lighting or lighting / adjustment module.
- Remove screw with washers and nut (16) completely and separate actuator (14) or threaded spindle from the battery box retainer
- If required, remove cable binders of the connection cable from the actuator (14).
- Remove screws with washers (2 and 3) plus screws with washers and nuts (4, 3 and 5) completely and detach battery box retainer (1) from the chassis.
- Loosen screws with washers and, if appropriate, with nuts (18) completely and detach modules.
- Loosen screws with washers and nuts (8, 9 and 10) completely and detach the connection socket with holder (15) from the battery box retainer (1).



NOTE:

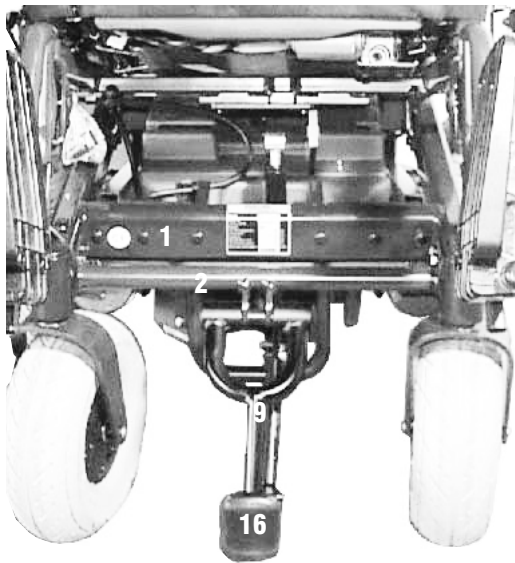
- Do not forget the cable binders.
- In TÜV-Version: Do not forget spring steel sheet for microswitch.

Assembly

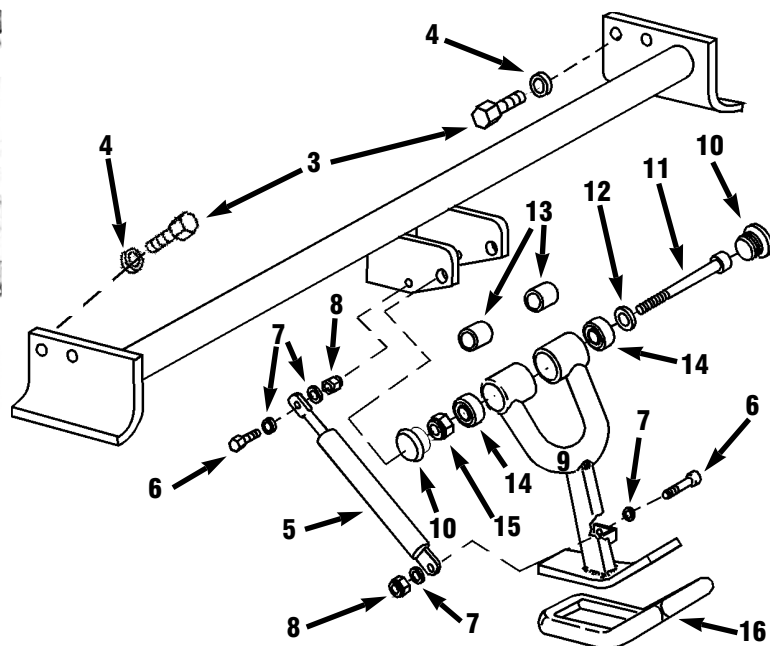
- The assembly is performed in reverse order.

11.8 Kerbstone Lifter

Kerbstone lifter, assembled



Kerbstone lifter, disassembled



1 Chassis
4 4x Washer
7 4x Washer
10 2x Stopper
13 2x Bushing
16 Lifter shoe

2 Kerbstone lifter support
5 Compression spring
8 2x Lock nut
11 Screw
14 2x Ball bearing

3 4x Screw M8x20
6 2x Screw
9 Kerbstone-lifter fork
12 Washer
15 Lock nut

Inspection

- Lifter shoe damaged?
- Screwings loose?
- Compression spring damaged?
- Weldment joints or kerbstone lifter support damaged?
- Weldment joints or kerbstone-lifter fork defective?

Remedy

- > Replace lifter shoe.
- > Tighten screws.
- > Replace compression spring.
- > Replace kerbstone lifter support.
- > Replace kerbstone-lifter fork.

Disassembly, complete

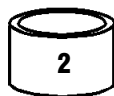
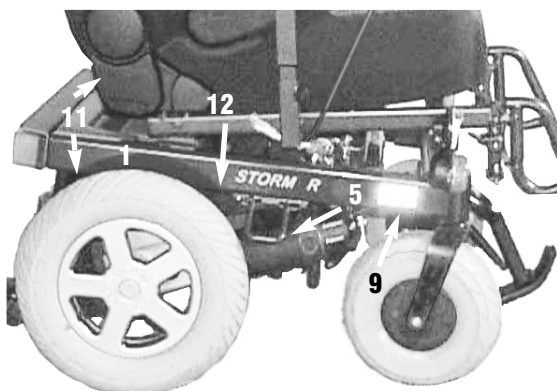
- Lift seating system and lock, if necessary.
- If necessary, remove lifter shoe (16).
- Loosen nuts (8) completely and detach together with washers (7).
- Remove screws (6) with washers (7) and detach compression spring (5).
- Remove two stoppers (10) and loosen nut (15) completely.
- Remove screw (11) with washer (12) and detach kerbstone-lifter fork (9) from the lifter support.
- If necessary, remove bushings (13) and press out ball bearing (14).
- Loosen four screws (3) completely and remove together with washers (4).
- Detach kerbstone lifter support (2) from chassis (1).

Montage

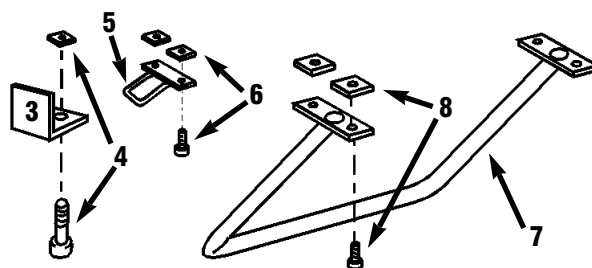
- The assembly is performed in reverse order.

11.9 Transport Bracket, Taxi Bracket, Cane Holder and Reflectors

View from the right



Accessories, disassembled



- | | | |
|--|---------------------|-----------------------|
| 1 Chassis | 2 Cane holder | 3 Angle |
| 4 Screw and nut | 5 2x Taxi bracket | 6 4x Screw with nut |
| 7 Transport bracket | 8 4x Screw with nut | 9 2x Reflector, glued |
| 10 Hook and fleece strap for cane holder (at upper part of the backrest frame) | | |
| 11 Fastening points for transport bracket (at the rear of the chassis) | | |
| 12 Fastening points for cane holder (at side part of chassis) | | |

Inspection

- Cane holder damaged?
- Screwings loose?
- Hook and fleece strap damaged?
- Weldment joints or taxi bracket damaged?
- Weldment joints or transport bracket damaged?
- Reflector damaged?

Remedy

- > Replace cane holder.
- > Tighten screwings.
- > Replace hook and fleece strap.
- > Replace taxi bracket.
- > Replace transport bracket.
- > Replace reflector.

Disassembly

- The disassembly is performed by unscrewing the respective fastening screws.

Assembly

- The assembly is performed in reverse order.



NOTE:

- The reflectors are fastened with double-sided adhesive tape.
- Before attaching new reflectors, remove first the old adhesive tape completely.

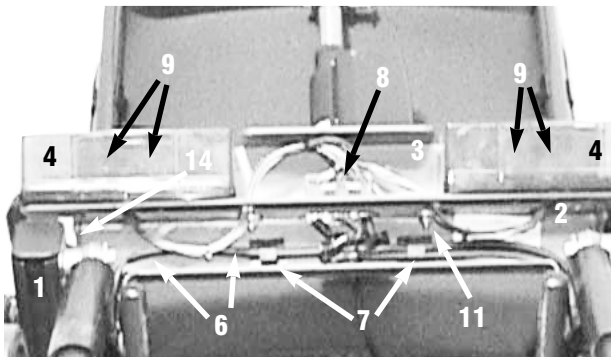


CAUTION:

Do not use any solvents that might attack the paintwork.

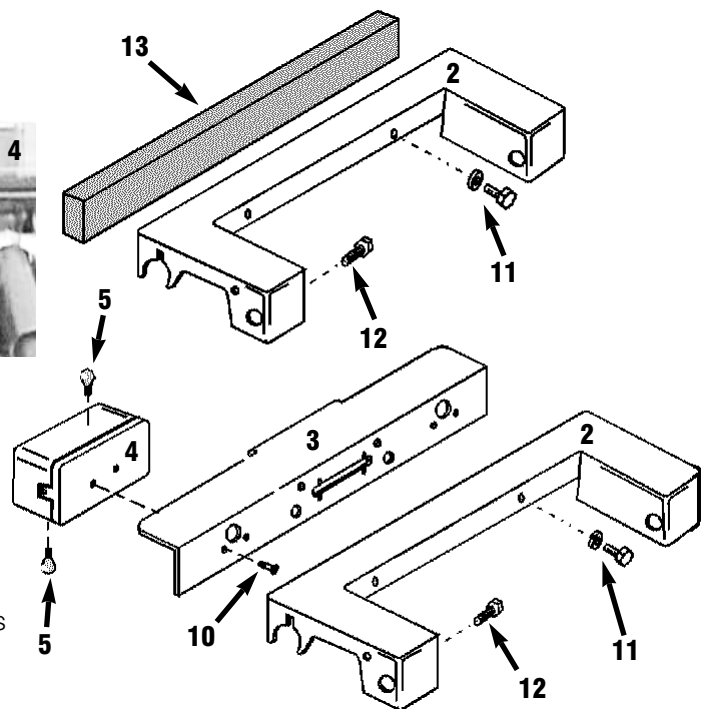
11.10 Lighting Bar / Bumping Bar

Lighting bar, assembled



- 1 Chassis
- 2 Rear covering
- 3 Lighting bar
- 4 Rear lights
- 5 Incandescent bulbs
- 6 Cable harness
- 7 Cable clips
- 8 Plug assembly with anti-interference capacitors
- 9 4x Tapping screw 3,9x15,5
- 10 4x Phillips screw M5x20 with lock nut M5
- 11 2x Screws M6x20 with lock nuts M6 and 4 washers 18x6,4x1,5
- 12 2x Screws M8x20 with washers
- 13 Bumper bar

Lighting bar / bumper bar, disassembled



14 Microswitch

Inspection

- Bumper bar damaged?
- Screwings loose?
- Rear covering damaged?
- Lighting bar damaged?

Remedy

- > Replace bumper bar.
- > Tighten screws.
- > Replace rear covering.
- > Replace lighting bar.

Disassembly bumper bar with rear covering

- Remove rear battery and fold rear covering (2) upward.
- Loosen screws with washers (11) completely and detach together with bumper bar (13).
- Loosen screws with washers (12) completely and detach together with rear covering (2).

Assembly

- The assembly is performed in the reverse order.

Disassembly lighting bar with rear covering

- Remove rear battery and fold rear covering (2) upward.
- Separate plug connections (8) and release cable harness (6) from the cable clips (7).
- Loosen screws with washers and nuts (11) completely and detach lighting bar (3).
- If required, loosen screws (9) completely and remove rear light caps.
- If required, remove lamps (5), separate plug connections in the lamps, loosen screws with nuts (10) completely, and detach the rear lights (4) from the lighting bar (3).
- If required, detach the microswitch (14) from the rear covering (2) (2 countersunk screws M4x20).
- Loosen screws with washers (12) completely and remove together with the rear covering (2) from the chassis.

Assembly

- The assembly is performed in reverse order.

12.0 Check and Repair Work on the Power Supply

12.1 Testing Batteries, Battery Boxes and Battery Voltage

✓ NOTE

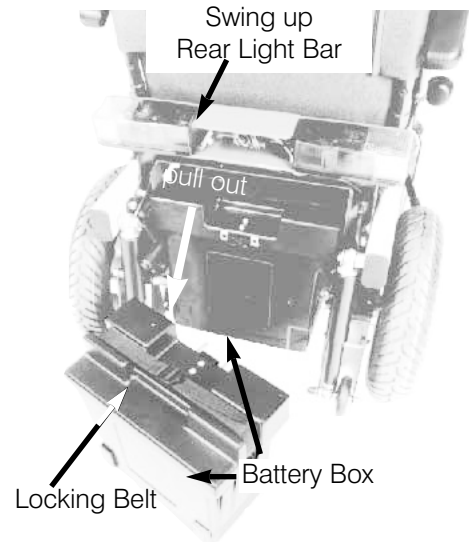
- Make sure that both batteries are charged.
If the total voltage is below 24 V, charge batteries completely (see chapter 12.2).
- If the battery voltage drops below 21 V during operation, the driving speed will be reduced step by step to minimize power consumption. If the voltage drops below 17 V, the power supply will be cut off entirely.
- The voltage of each individual battery should not be less than 9.5 V.
- A voltage drop can be checked during driving operation with turned-on lighting and activated hand brake.

CAUTION:

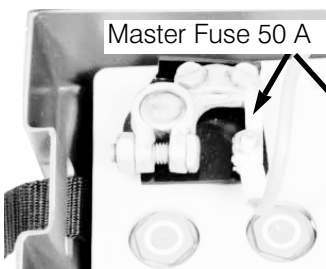


- Handle tools carefully. Do not bridge the battery poles.
> Danger of Short Circuit <
- Take into account the weight of the batteries of approx. 22 kg.
> Danger of Crushing <

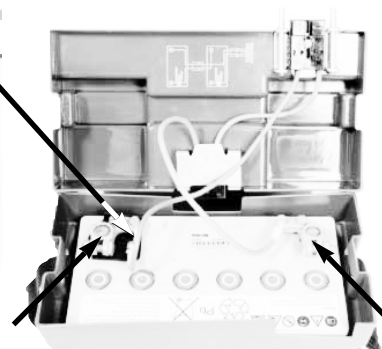
Removal of Battery Boxes



Detail: + Terminal



Battery Box

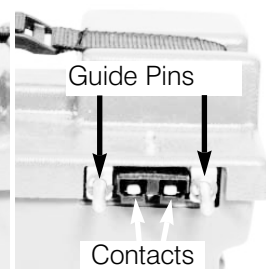
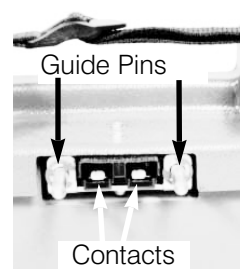


+ Terminal
(red cable)

Detail: External Contacts of the Batteries

Battery, outside

Battery inside



- Terminal
(blue cable)

✓ NOTE:

Exact information on the condition of the batteries can be obtained by a capacity test, which can only be performed by the manufacturer.



CAUTION:

For the replacement of batteries, use exclusively gel batteries brand Sonnenschein. Type: Dryfit A 512 / 55A (INVACARE Item No.: P50 992)



Inspection

- Voltage decreasing heavily under strain (driving operation, hand brake applied and lights on)?
- Total voltage below 24 V?
- Voltage of one battery below 9,5 V?
- Precharging not possible or battery damaged?
- No voltage at external contacts?
- Contacts of batteries corroded or damaged?
- Check all cables, plugs and master fuses.
- Battery-box lid or battery box damaged?
- Locking belt damaged?
- Guide pins or external contacts damaged?

Remedy

- > Load batteries (see chapter 12.2).
- > Load batteries (see chapter 12.2).
- > Preload battery (see chapter 12.2)
- > Replace battery.
- > Replace master fuse (50A) or cable.
- > Clean contacts, replace, if necessary.
- > Replace if necessary.
- > Replace if necessary.
- > Replace locking belt.
- > Replace, if necessary.

Checking Overall Voltage of the Batteries

- Check the overall voltage of the batteries with a multimeter (range 50V / 25 DC) at the charging socket of the joystick box.

Inspection

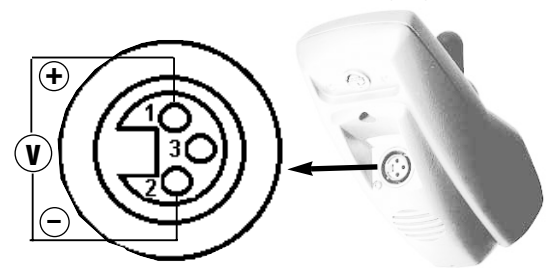
Remedy

- Voltage below 24 V? > Charge batteries (see chapter 12.2).
- Voltage below 19 V? > Check individual voltage of each battery.
- Voltage at zero? > Check individual voltage of each battery.

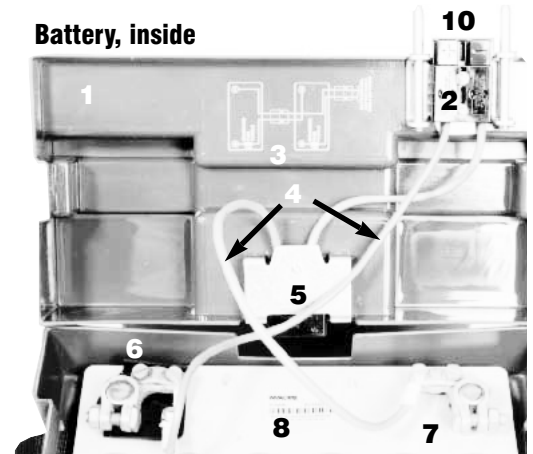
✓ NOTE:

- The internal battery has external contacts (2) with the 24 V-supply of the wheelchair, as well as internal contacts (5) with the serial connection with the external contacts of the external battery.
- To measure the voltage, open the locking belt (9) and remove the lid of the battery box (1).

Charging Socket



Battery, inside



- 1 Battery-box lid
- 2 External contacts of the cable harness.
- 3 Connection diagram for the batteries
- 4 Cable harness, complete
- 5 Internal contacts of the cable harness.
- 6 Terminal (+) and master fuse
- 7 Terminal (-)
- 8 Battery
- 9 Locking belt
- 10 Guide pins

Testing the individual voltage of the batteries

- For the removal of the batteries, see **Disassembly**, below.
- Measure the individual voltages of both batteries with a multimeter (range 50V / 25V DC).

Inspection

Remedy

- Voltage below 9,5 V? > Precharge batteries (see chapter 12.2).
- Voltage at zero? > Check master fuse (50A) of the battery plus internal cables and replace, if necessary, or replace battery

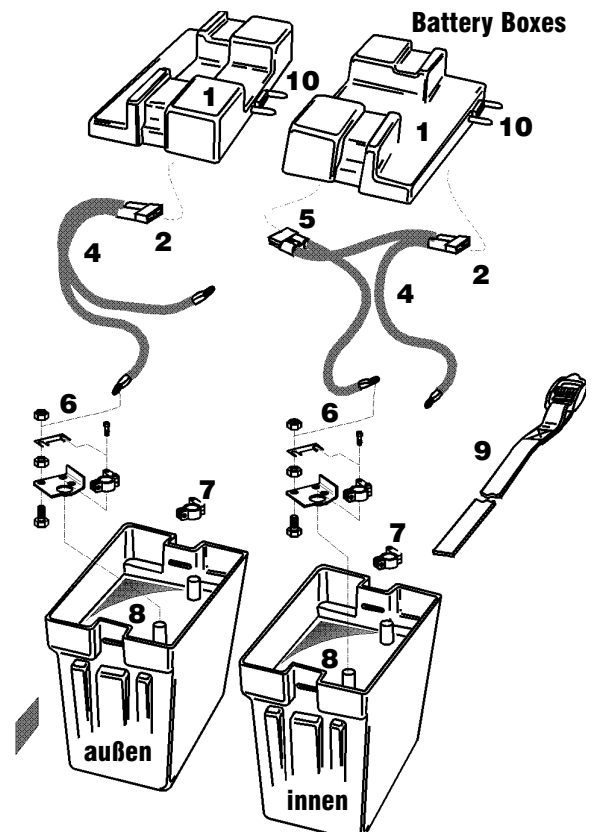
Disassembly

- Grip lighting bar at its center and turn upwards.
- Hold battery boxes one after the other by the locking belt (9), support with your other hand, and pull backwards from the battery frame.
- Loosen the locking belt (9) and take off the lid (1).
- Loosen the screwings (first the negative pole) of the pole binders (6 and 7) and detach binders with fuse plus the lid from the battery and the box.
- Loosen the nuts and washers at the external (2) and internal contacts (5) inside the lid (1), and detach the cable harness completely from the lid (1).
- Lift battery (8) from the box with the aid of the locking belt (9).
- Pull the locking belt (9) out of the box.

Assembly

- Follow the steps in reverse order.

Battery Boxes



12.2 Charging the Batteries



CAUTION:

- *Careful when testing / charging. Do not bridge the battery poles.
> Danger of Short Circuit <*



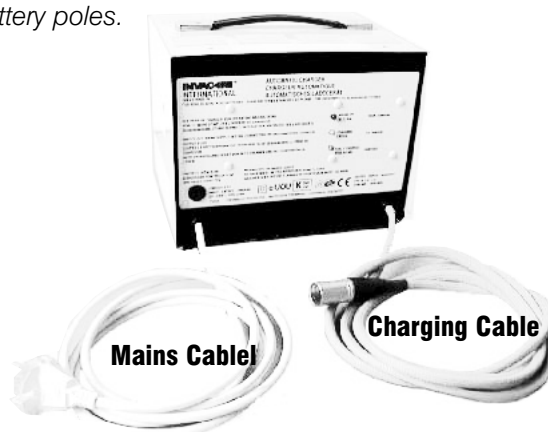
NOTE:

Also observe the information on battery charging provided

- in the User's Manual of the STORM
- in the User's Manual of the charger,
- on the front and back of the charger.

For care and maintenance of the battery's mechanical components, see chapter 12.1.

INVACARE Charger



Inspection

- Status display at joystick box blinking 7x (fully discharged)?
- Status display at joystick box blinking 8x (excess voltage)?
- Measuring voltage at the batteries:
 - Voltage below 11,5 V?
 - Voltage below 9,5 V? (Battery fully discharged.)
- Voltage difference (Tolerance $\pm 0,2$ V) in the two batteries?

Remedy

- > Measure voltage of battery.
- > Charger defective. See chapter 12.3.
- > Charge with original charger.
- > Precharge with unregulated charger up to 10 V. (See description below)
- > Replace batteries.

Joystick Box



Charging Process



CAUTION:

- *The batteries are not permitted to lie on their sides or up-end during the charging process. The battery poles must point upwards.*
- *In the STORM with ACS, only batteries of type Dryfit A 512 / 55A may be used.*
- *Batteries and charger must be exposed to the same ambient temperature, since the charging process, among other factors, is controlled by temperature sensors. Extended charging cables and different locations of charger and batteries result in a faulty charging.*



NOTE

- Procedure when charging the batteries with the INVACARE charger:
Also see the STORM's User's Manual.
- Observe the following order when connecting the INVACARE charger:
First connect the charging plug, then the mains plug.
- Fully discharged batteries cannot be charged with the INVACARE charger
- If the batteries cannot be fully charged, they must be replaced.
- When fully charged, the display "Full Charge" on the charger must light up.
As soon as a charging voltage of 28 V is achieved, the LED's on the joystick box will flash additionally.
The voltage of an individual battery at full charge and room temperature must amount to (approx. 20 - 22°C) 14 $\pm 0,2$ V.

Charging fully discharged batteries

If the voltage of a battery measures less than 9,5 V, the battery is **fully discharged**.

For charging fully discharged batteries, proceed as follows:

- Remove battery boxes and open. See chapter 12.1 in this respect.
- Precharge each battery individually while simultaneously measuring the charging voltage.
- Precharge up to 10 V with an **unregulated** charger.
After that, stop charging with the unregulated charger.



CAUTION:

- *The batteries are not permitted to lie on their sides or up-end during the charging process.*
- *Do not fully charge batteries with the unregulated charger. This could destroy the batteries.*
> Danger of Explosion <

- Close battery boxes and re-install.
- Fully charge battery with the INVACARE charger via the charging socket of the joystick box. The charging process should last at least 48 hours.

12.3 Battery Charger



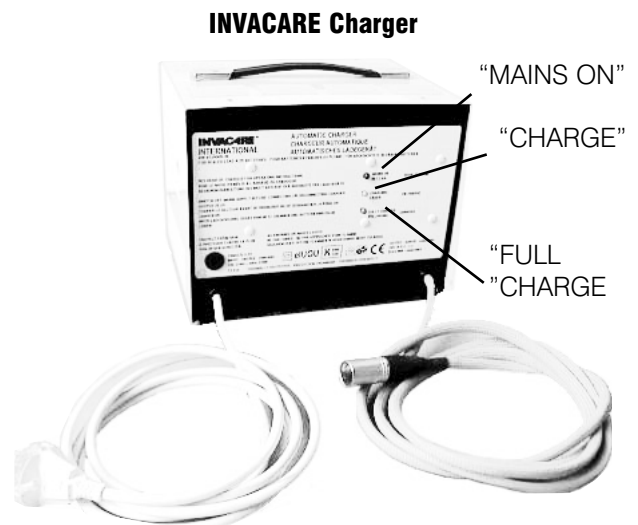
NOTE

Also observe the instructions for charging the batteries

- in the User's Manual of the charger,
- on the front and back of the charger.

Performance Test

- Plug in the charger' mains plug.
 - Red LED "MAINS ON" illuminated.
- Disconnect again the mains plug from the mains.
- Plug the charging plug into the charging socket of the joystick box and then reconnect the mains plug.
 - Green LED "FULL CHARGE" will light up for approx. 3 seconds
 - and will then change to the yellow LED "CHARGE".
- Pull mains plug.

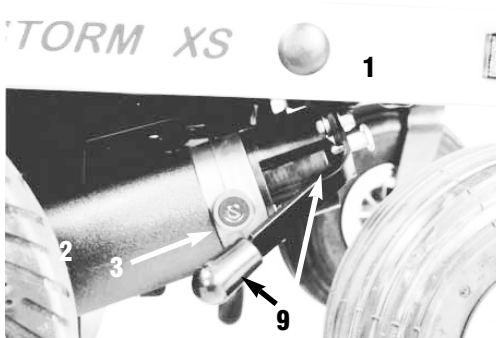


Malfunction	Cause	Remedy
• Red LED "MAINS ON" not illuminated?	- Supply voltage 230 V missing. - Charger defective.	> Test 230 V mains. > Replace charger.
• Yellow LED "CHARGE" not illuminated	- Batteries fully discharged. - Charger defective.	> Test battery voltage. > Replace charger.
• Green LED "FULL CHARGE" not illuminated?	- Excess voltage in batteries. - Status display blinking? - Charger defective.	> Test charging voltage. > Test batteries. > Replace charger.

13.0 Check and Repair Work on Drive Motors

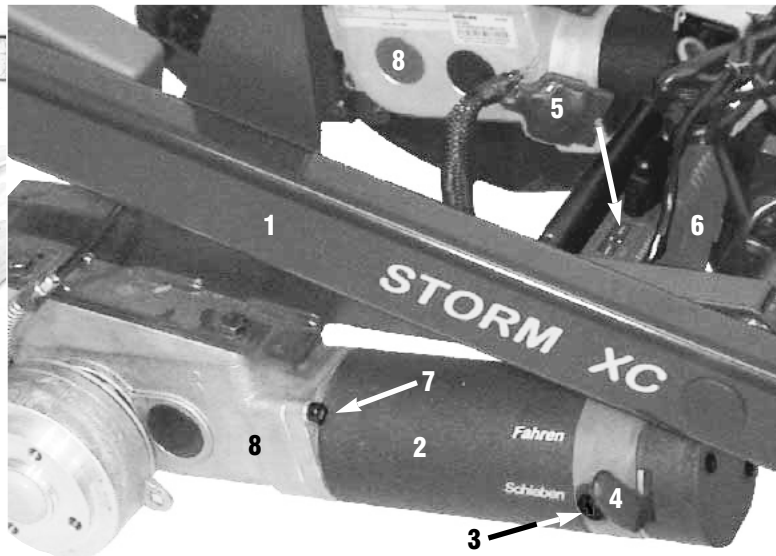
13.1 General

Drive motor, assembled



- 1 Chassis
- 2 Drive motor
- 3 2x Stopper for carbon brush
- 4 2x Coupling lever
- 5 Motor plug
- 6 Main module
- 7 2x Allen screw M6x30 with lock washer
- 8 Gear
- 9 Coupling mechanism

Drive unit, assembled



✓ NOTE:

- Depending on type, the motors can be equipped with a coupling mechanism or with separate coupling levers.

Inspection

- Motor vibrating, emitting running noises?
- Motor won't start?
- Power brake not reacting?
- Gear emitting running noises or being blocked?

Remedy

- > Test motor, replace if necessary.
 - > Test motor, replace if necessary.
 - > Test brake, replace motor, if necessary.
 - > Replace drive unit or gear.
- See chapter 11.6.

13.2 Testing or replacing carbon brushes

✓ NOTE:

- Worn-out carbon brushes lead to a deterioration of the motor performance.
- Each motor is equipped with two carbon brushes. They are located behind the lateral stoppers (4) of the motors.

Removing carbon brushes

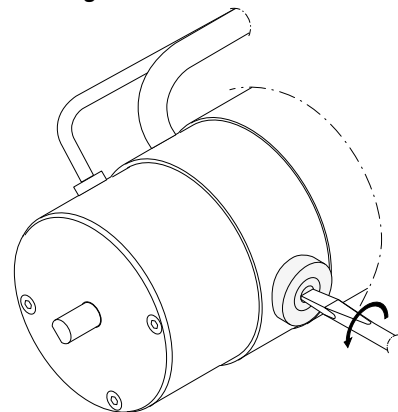
- Remove the stopper (4).

✓ NOTE:

Make sure that, while you loosen the stopper, same is being subjected to a slight spring pressure.

- Pull carbon brush from its guide.

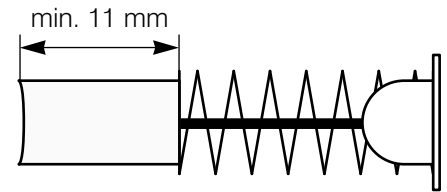
Removing carbon brushes



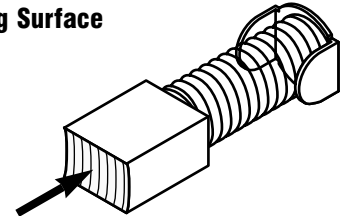
Testing carbon brushes

- Testing length:
Measure the length of the carbon brush.
Original length = 13 mm.
Wear limit = 11 mm
Once the carbon brush has reached the wear limit of 11 mm, it must be replaced.
- Testing the bearing surface:
Perform a visual inspection of the running surface.
It must show only slight running traces.
If the running surface shows deep grooves, the motor collector is damaged.
Any further repair of the motor can only be performed by the INVACARE-Service Department.

Wear Limit



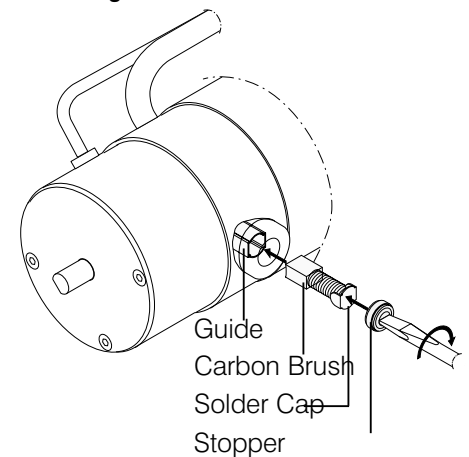
Running Surface



Installing carbon brushes

- Place carbon brush into its guide (see drawing).
- ✓ **NOTE:**
Make sure that the carbon brush is not canted when introduced. It must be able to move smoothly within the guide.
- Introduce the solder cap of the carbon brush into the guide as shown in the drawing.
 - Screw in the stopper.
- ✓ **NOTE:**
Do not fasten too tightly, it would destroy the stopper.

Installing Carbon Brushes



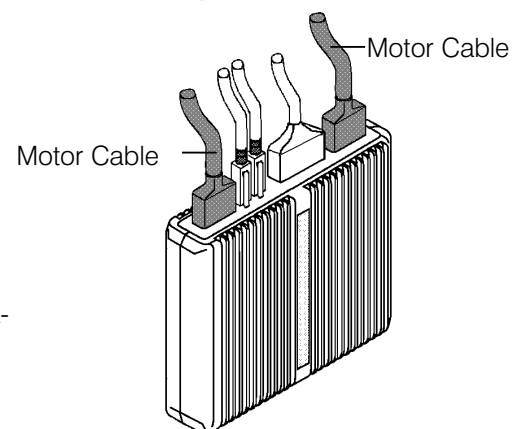
13.3 Testing motor, magnetic brake and free-wheel switch

Testing preparations / replacing drive motors

- Remove battery boxes.
- Remove splash protection.
- Remove cable binders.
- Remove the connection plug of the motor to be tested or replaced from the socket board.

- ✓ **NOTE:**
Press down plug lock as otherwise the plugs would be damaged.

Remove BUS plus



Testing drive motors

Only basic tests can be performed on the drive motors. Any further tests are only possible with special testing instruments.

The following components of the drive motors can be tested by means of a multimeter:

- Motor coils for continuity
- Motor brakes for resistance

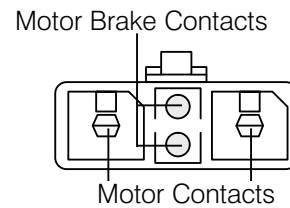
Testing hints:

If the following tests show no results, the drive motor should be sent in for testing. Any further measurements can only be performed by the INVACARE Service Department.

Visual test of the plug contacts:

Test whether the contacts of the plug are not unduly bent up, pushed back or oxidized.

Plug Contacts



Testing the electric circuit of the motor

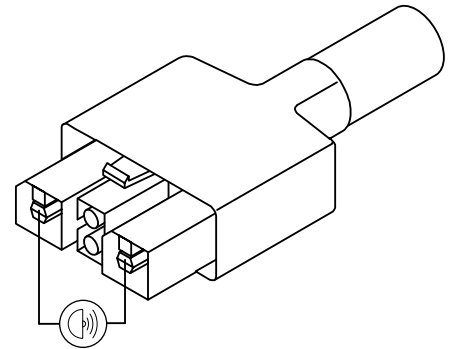
- Set multimeter to continuity check.
- Measure the continuity of the motor's electric circuit at the plug contacts shown in the drawing to the right.



NOTE:

Instructions on the use of the multimeters can be found in the User's Manual.

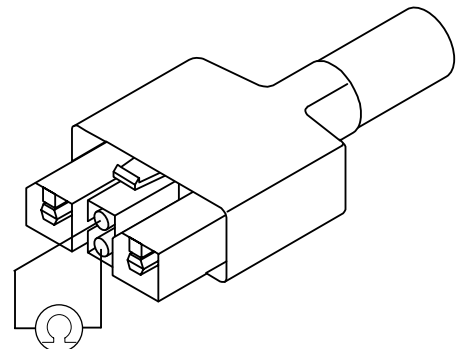
Testing the Electric Circuit of the Motor



Testing the magnetic brake

- Engage the motors.
 - Set the multimeter to resistance measuring.
 - Measure the resistance of the brake coils at the plug contacts shown in the drawing to the right.
- It must amount to between 20 ohms and 200 ohms.

Testing Magnetic Brake



Resistance = 20 ohms - 200 ohms

Testing the free-wheel switch:

The free-wheel switch switches the motors to pushing operation, putting the magnetic brake out of function.

- Disengage motors.
 - Set multimeter to resistance measuring.
 - Measure the resistance of the brake coils at the plug contacts shown in the drawing to the right.
- The resistance measured must amount to infinite.

Malfunction	Cause	Solution	Chapter
No continuity of the electric circuit of the motor.	Parted cable in the motor. Carbon brushes worn out.	Replace motor. Check / replace carbon brushes.	13.4 13.2
Resistance being 0 ohms. Resistance clearly > 200 ohms, but not infinite.	Short circuit in magnetic brake. Defective contact in the magnetic brake. -	Replace motor. Replace motor.	13.4 15.4

13.4 Disassembly / Assembly of Drive Motor

Disassembly of drive motor

✓ **NOTE:**

- The first two steps apply only to motors with a coupling mechanism.
 - Loosen locking screw (SW 8 mm) at the disengaging lever of the motor to be replaced.
 - Remove the disengaging lever.
 - Support drive motor with your hand, loosen completely two - fastening screws (hexagon socket, SW 5 mm) with lock washers and detach drive motor.
- ✓ **NOTE:**
- Do not damage / lose plastic bushing and starting damper.

Assembly drive motor

- Push plastic bushing on the motor output shaft.

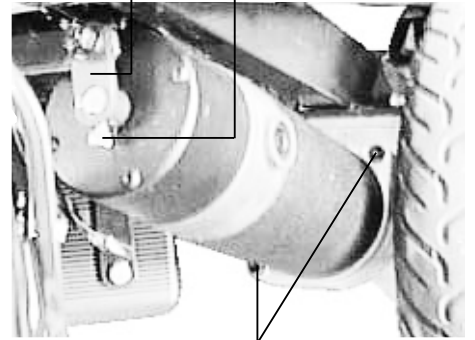
- Place starting damper on the gear input shaft.
Make sure that the driver of the starting damper interlocks with the gear input shaft.
- Fasten the motor to the gear by means of the two fastening screws (hexagon socket SW 5mm) and the two lock washers.
The following is to be observed:
 - The motor cables must point upwards to the frame of the chassis.
 - The slot of the motor output shaft must be in alignment with the driver of the starting damper.

✓ **NOTE:**

- If key and slot are not aligned exactly, turn the driving wheel (gear output shaft) until the slot locks into place and the motor is located exactly in front of the gear.
- Fasten screws hand-tight. Do not overturn.

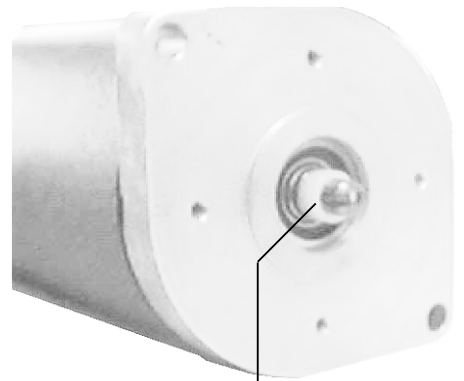
Motor fastening

Locking screw, M5 x 10 - SW 8 mm
Disengaging Lever



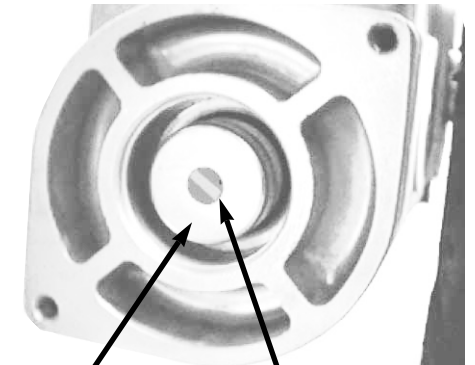
Fastening Screw,
Hexagon Socket M6 x 30 - SW 5 mm

Motor Output Shaft



Plastic Bushing

Gear Input Shaft



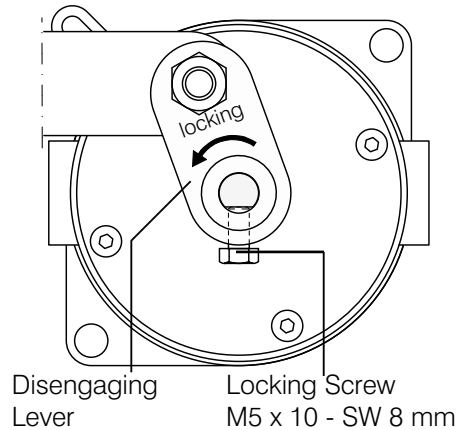
Starting Damper Driver

NOTE:

- The following two steps apply only to motors with a coupling mechanism.

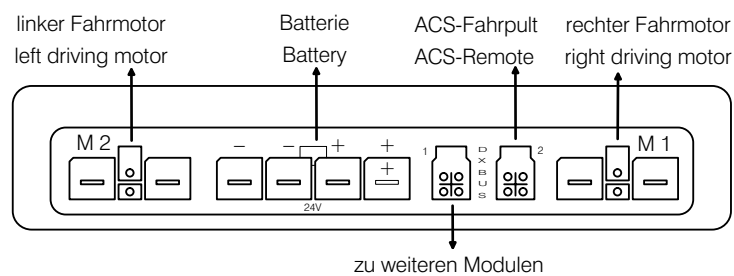
- Lock the motor by turning the shaft left by means of a suitable tool (e.g., a pipe wrench) = driving position.

- Now mount the disengaging lever and fasten it by tightening the locking screw (SW 8 mm).
The locking screw (M 5 x 10) must contact exactly the flattened part of the shaft (see drawing).

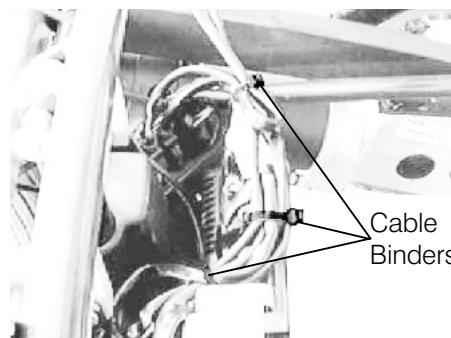
Position of Disengaging Lever**NOTE:**

Following the assembly, make sure that no moving parts such as rods or screw connections are sliding against the motor casing. Conduct a performance test.

- Lead the motor cable to the main module and plug the connection plug into the socket board.

Connection Plan: Motor Plug

- Secure the cables by means of cable binders
- Mount the splash protection.

Position of the Cable Binders**CAUTION:**

Following the assembly, the correct operating of the disengaging lever as well as the driving functions must be tested.

>Make a test drive!<

14.0 Check and Repair Work on the Actuators

14.1 General

In the STORM Standard and Comfort qualities, the actuator motors are activated by the ACS via an actuator module. Depending on each type, the STORM Standard or Comfort can be equipped with the following actuators:

- Actuator for seat angle adjustment,
- Actuator for backrest adjustment,
- Actuators for legrest adjustment,
- Actuator for chin control.

The control of the actuators is performed via the joystick box and, if required, via an additional control box.

The socket boards for the connection of the actuators are located in front under the seat of the wheelchair.

The occupancy of the individual plug connections is marked by symbols.

The STORM-Recaro usually has only an actuator for the seat angle adjustment, which is controlled by the ACS. The remaining adjustment options are integrated in the seat and are a part of the Recaro seat. The control panel is located in the surface of the seat. That is why the entire seat must be replaced when the adjustment options are faulty.

14.2 Testing the actuators

The following tests can be performed on the actuator motors:

- Performance test by voltage application
- Continuity test of the motor coils by means of a multimeter

Visual test of the plug connections:

Check whether the contacts of the plug are pushed back or oxidized.

Continuity test:

- Pull the plug of the actuator to be tested out of the socket board.
- Set the multimeter to continuity test.
- Measure the continuity of the electric circuit of the actuator at the inspection windows shown in the drawing at the right.

Performance Test:

- Pull the plug of the actuator to be tested out of the socket board.
- Apply a testing voltage of 24 V direct-current to the plug contacts at the inspection windows (see drawing at right).
- Interchange the testing connections to reverse the moving direction.

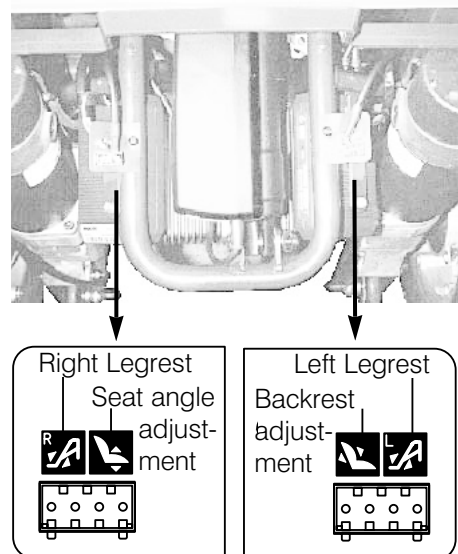


CAUTION:

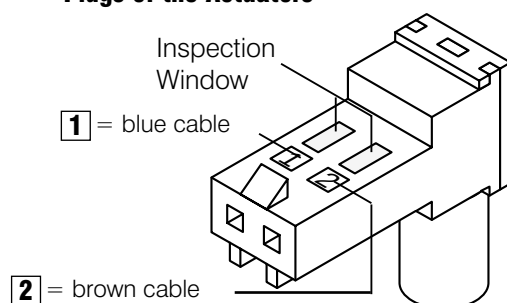
Prevent to bridge the contacts by all means.
>Danger of Fire and Burning<.

Disorder	Cause	Remedy
No measurable continuity . Performance test negative.	Cable parted Motor defective.	Replace actuator motor. Replace actuator motor.

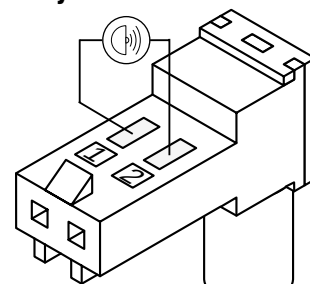
Plugs for Electric Actuators



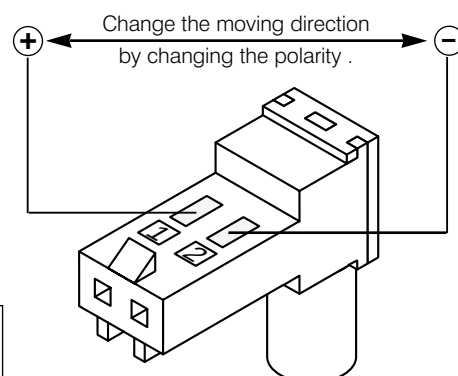
Plugs of the Actuators



Continuity test



Performance Test (Testing Voltage 24 V)

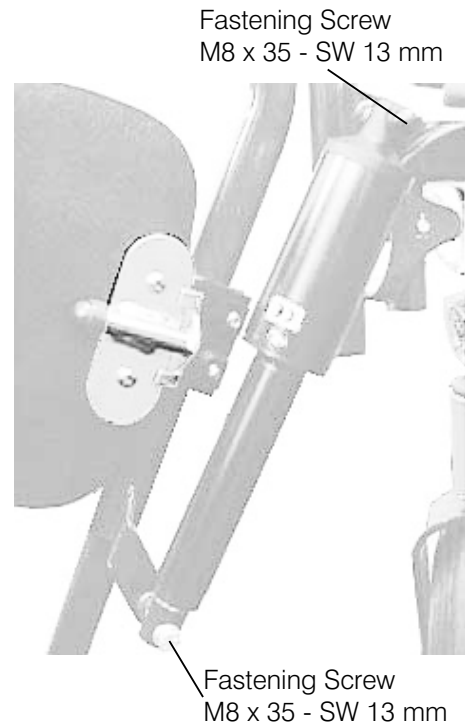


14.3 Replacement of Actuators for Legrests

Disassembly

- Pull the plug of the actuator to be replaced out of the socket.
- Remove the cap of the upper actuator fastening.
- Now disassemble the actuator by removing two fastening screws (SW 13 mm).

Actuator for Legrest



Assembly

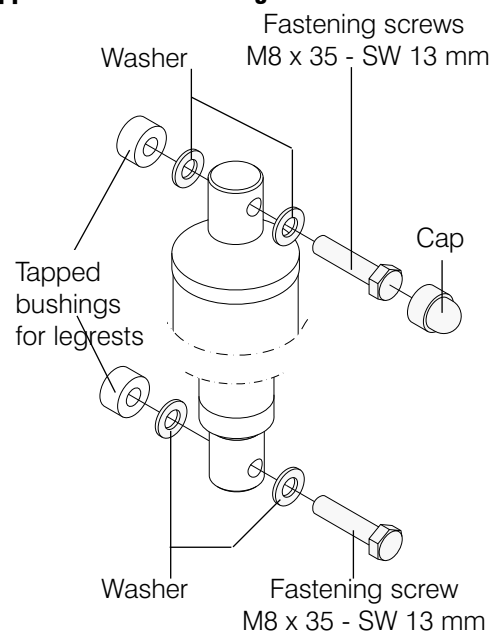
- Install the new actuator and fasten it by tightening the two fastening screws.
- Lead the actuator cable to the corresponding socket board and plug the plug into the socket.
- Conduct a performance test.



NOTE:

- Do not tighten the fastening screws too tightly.- The actuator must be able to move within its fastenings.
- Install the cable in a way where it cannot get pinched.

Actuator, Upper Actuator Fastening



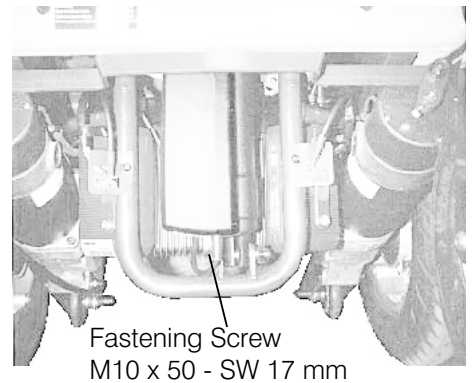
Lower Actuator Fastening

14.4 Replacement of Actuator Seat Adjustment

Disassembly

- Remove the quick-release bolt, fold the seat frame upward and secure the seat.
- Pull the plug of the actuator out of the socket.
- Now detach the actuator by removing the lower fastening screw (SW 17 mm).
- Detach the top of the motor's connecting rod. See chapter 14.4 in this respect.

Actuator Seat Adjustment



Assembly

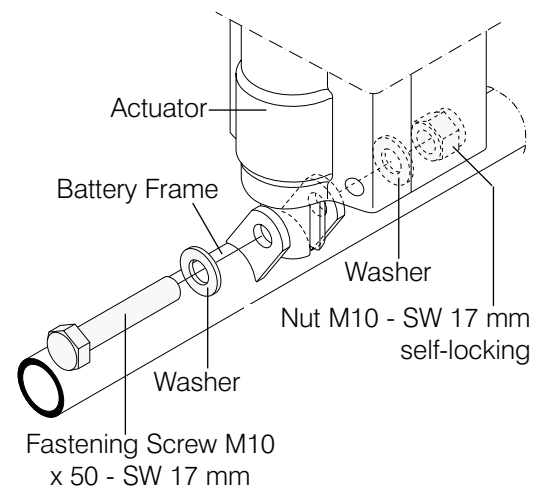
- First mount the top of the connecting rod.
- Install the new actuator and fasten it by tightening the lower fastening screw.
- Lead the motor cable to the socket board and put the plug in to the socket.
- Fold the seat frame downward again and fasten the motor to the seat by means of the quick-release bolt.
- Conduct a performance test.



NOTE:

- Do not screw down the fastening screws too tightly. The actuator must be able to move within its fastenings.
- With too much tightening, the fastening clips can bend.
- Place the cable in a way where it cannot get-pinch.

Actuator, Lower Actuator Fastening



14.5 Replacement of the Actuator Backrest Adjustment

Disassembly

- Remove quick-release bolt, tilt seat frame upward and secure the seat.
- Pull the plug of the actuator out of the socket.
- Unhook the actuator cable from the clamps located under the seat plate.
- Remove the quick-release bolt at the upper fastening of the actuator.
- Now detach the actuator by loosening the lower fastening screw (SW 17 mm).

Assembly

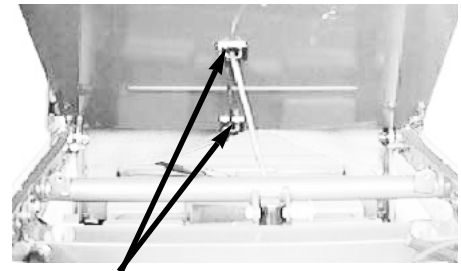
- Install the new actuator and fasten it by tightening the lower fastening screw.
- Insert the quick-release bolt into the upper actuator fastening.
- Lead the actuator cable through the clamps under the seat to the socket board and put the plug into the socket.
- Conduct a performance test.



NOTE:

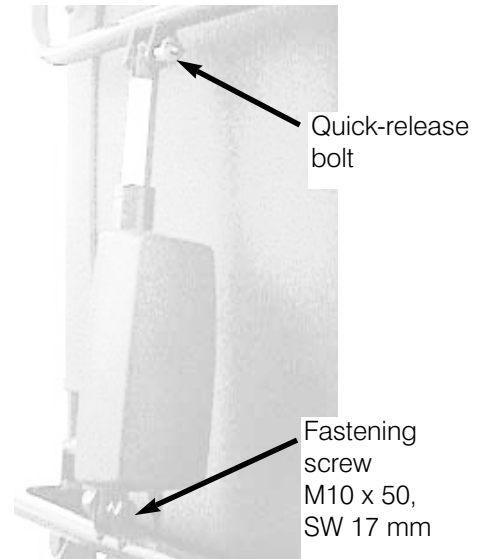
- Do not screw down the fastening screws too tightly. The actuator must be able to move within its fastenings.
- Tightening too firmly can cause the fastening - links to bend.
- Arrange the actuator cable in a manner where it cannot get pinched in.

Fastening Points of Actuator Cable

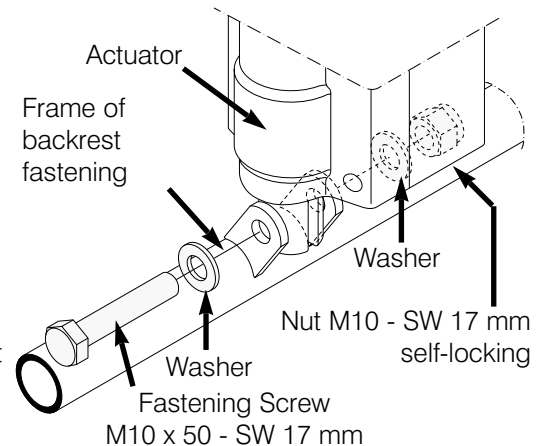


Connection cable of the electric backrest adjustment

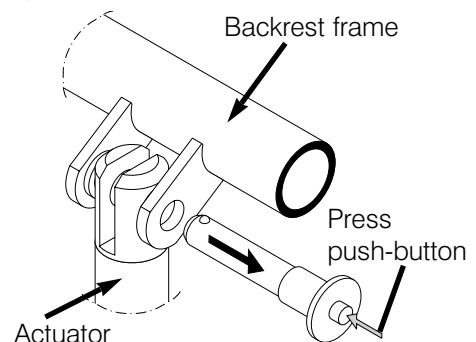
Actuator Backrest



Actuator, Lower Actuator Fastening

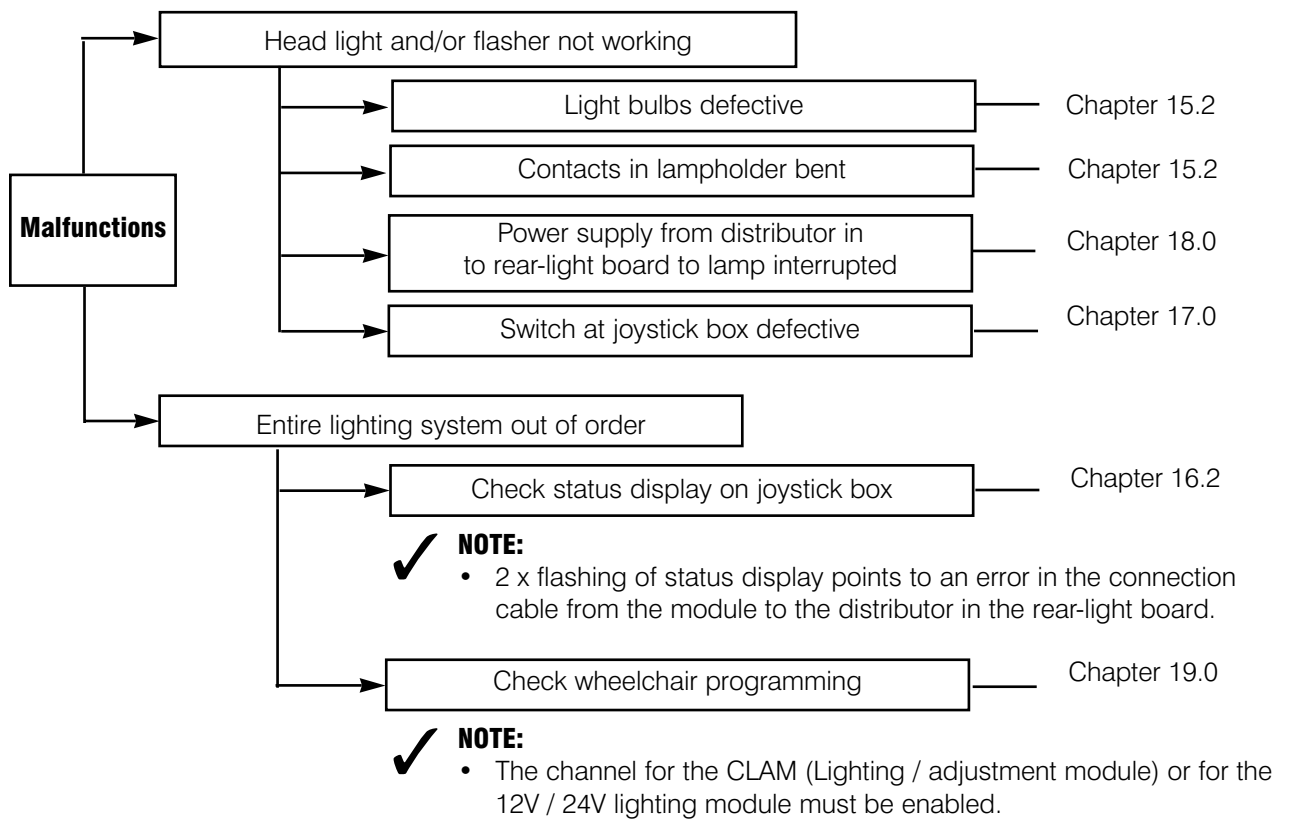


Quick-release Bolt

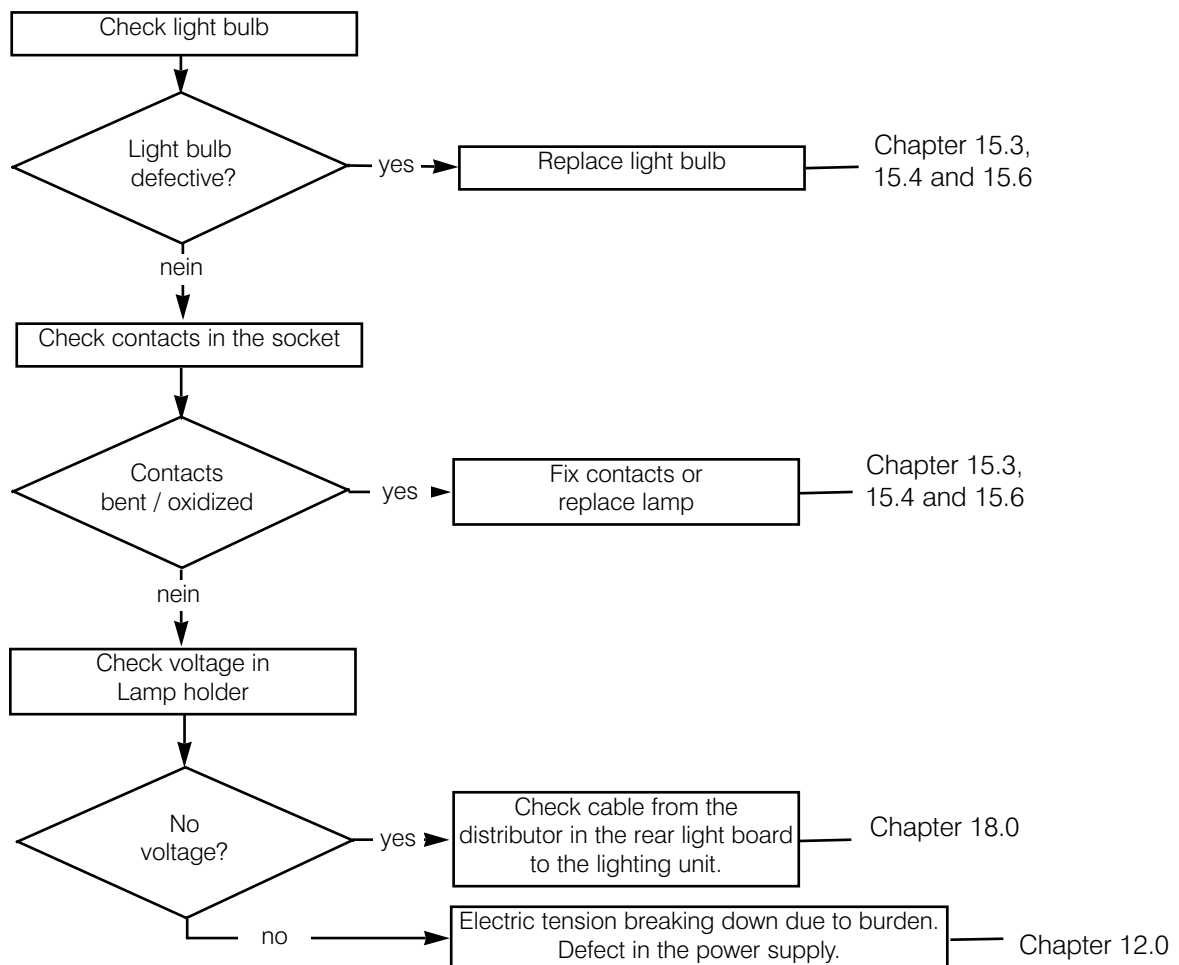


15.0 Check and Repair Work on the Lighting System

15.1 Causes of Malfunctions



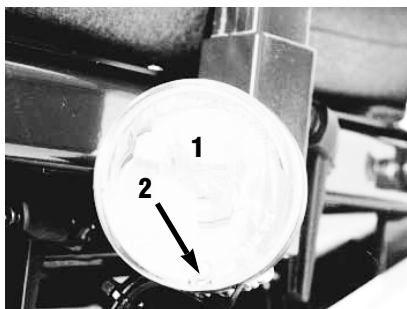
15.2 Check Lighting



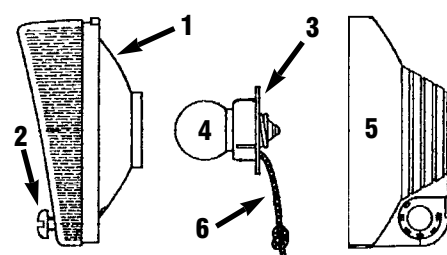
15.3 Disassembling / Testing Headlight

- 1 Headlight glass with mirror
- 2 Tapping screw 2,9x15
- 3 Lamp holder
- 4 Light bulb
- 5 Headlight casing
- 6 Connection cable
- 7 Spring-finger connector

Headlight, assembled



Headlight, disassembled



Disassembling headlight and light bulb

- Loosen tapping screw (2) and remove headlight glass (1).
- Pull lamp holder (3) from the headlight glass (1).
- Screw the light bulb (4) out of the lamp holder (3).

Test

- Test by means of a multimeter the voltage existing between the contact (7) of the headlight casing (+ pole) and the black cable (- pole) at the lamp holder (3).
- | | | |
|-------------|------------------------------|--------|
| Voltage in: | 6 km/h wheelchair | = 24 V |
| | 10 km/h wheelchair (abroad) | = 24 V |
| | 10 km/h wheelchair (Germany) | = 12 V |



CAUTION:

Avoid bridging the poles by all means.
>Danger of Fire and Burning<.

- Insert the new light bulb (4).
- | | | |
|---------------|------------------------------|-------------------|
| Type of bulb: | 6 km/h wheelchair | = 24 V / 3 watts |
| | 10 km/h wheelchair (abroad) | = 24 V / 3 Watt |
| | 10 km/h wheelchair (Germany) | = 12 V / 2.4 Watt |



NOTE:

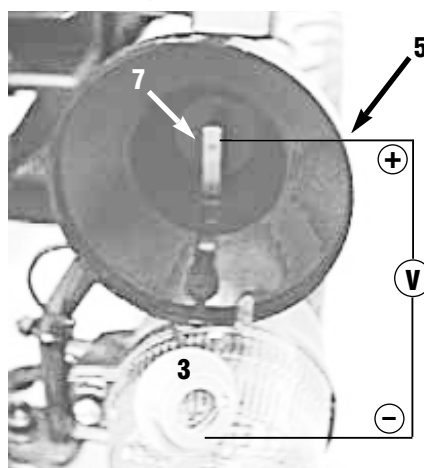
Make sure that the ground cable is located in the lamp holder and does not touch the positive pole of the light bulb (4).



NOTE:

- Test, if appropriate, whether the thread of the lamp holder is oxidized (rusty).
- For that, detach headlight casing (see chapt. 15.5), clean thread, if necessary, and grease slightly.

Check Voltage



Assembly

- Mount the headlight glass (1).



NOTE:

The tab at the headlight glass (1) must interlock with the slot of the headlight casing (5).

- Make sure that the contact (7) in the headlight casing fits closely to the positive pole of the light bulb (4).
- Fix the headlight glass by means of the tapping screw (2)

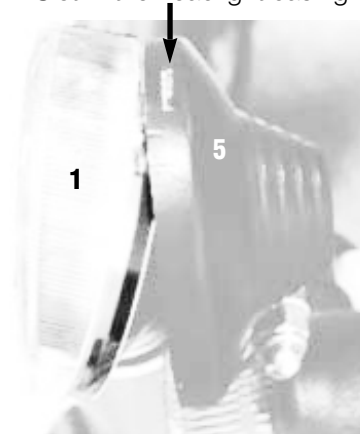


NOTE:

The contact fits correctly, if a slight pressure must be applied when inserting the headlight glass (1).

Mounting the Headlight Glass

Slot in the headlight casing



15.4 Disassembly / Test of Front Flasher

Disassembly

- Loosen the fastening screw and remove the flasher glass.
- Unlock the light bulb by pressuring down slightly and turning by 1/8th rotation to the left.
- Pull the light bulb from the base.

Testing

- Test by means of a multimeter the voltage existing between the contact in the flasher casing (+ pole) and the lamp base (- pole).
Voltage in: 6 km/h wheelchair = 24 V
 10 km/h wheelchair (abroad) = 24 V
 10 km/h wheelchair (Germany) = 12 V



CAUTION:

Avoid bridging the poles by all means.
>Danger of Fire and Burning<.

Montage

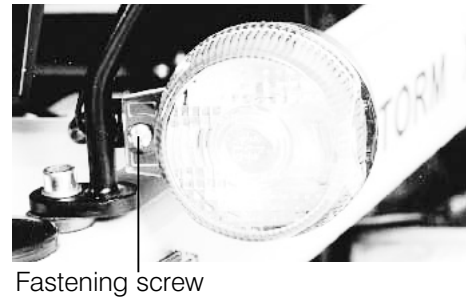
- Insert the new light bulb.
Type of bulb: 6 km/h wheelchair = 24 V / 10 watts
 10 km/h wheelchair (abroad) = 24 V / 10 watts
 10 km/h wheelchair (Germany) = 12 V / 10 watts
- Lock the light bulb by pressing down slightly and turning by 1/8th rotation to the right.
- Mount the flasher glass.
- Fix the flasher glass by means of the fastening screw.



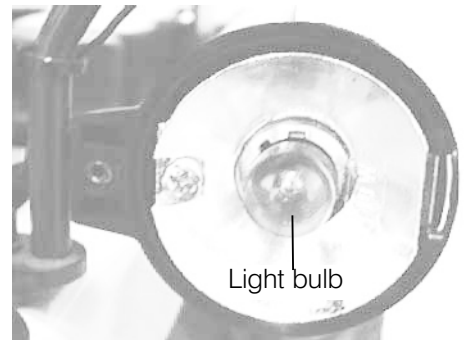
NOTE:

Make sure when mounting the flasher glass that the tab on the side of the glass interlocks with the slot of the flasher casing.

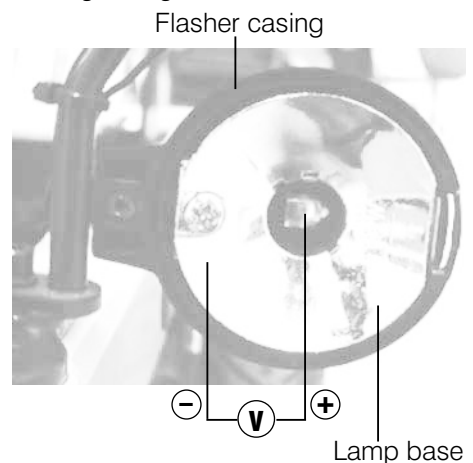
Removing Flasher Glass



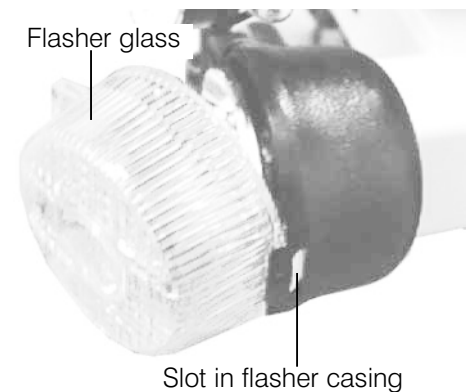
Removing Light Bulb



Testing Voltage



Mounting Flasher Glass



Disassembly Flasher

- Loosen tapping screw (8) completely and detach flasher glass (16).
- Press down flasher bulb (18) slightly, turn by 1/8th revolution to the left, and pull from the base (11).
- Loosen screw (9) and detach.
- Turn flasher casing (17) slightly left / right and carefully pull from the lampholder (1) until connection cable (4) is released.
- Pull mirror with lamp base (11) carefully from the flasher casing (17) up to the point where the connections at the lamp base become accessible.
- Mark the connections, unsolder from the lamp base and detach mirror with base (11).
- Pull connecting cables (4) from the flasher casing (17) and detach the casing.

Assembly

- The assembly is performed in the reverse order.

Disassembly Lampholder

- Detach headlight (3) completely.
- Detach flasher (2) completely.
- Remove cable binder (10).
- Loosen screw and washer (5) completely and detach together with lamp holder(1).
- If necessary, remove washer and rubber bushing (6) from the chassis (12).

Assembly

- The assembly is performed in the reverse order.



NOTE:

- Do not forget the cable binder.

15.6 Disassembling / Testing Taillight, Flasher and Rear Light

- Loosen fastening screws.
- Pull off rear light glass.
- Release the corresponding light bulb by slightly pressing down and turning by 1/8th rotation to the left.
- Pull the light bulb from the lamp base.
- Test by means of a multimeter the voltage existing between the contact in the casing (+ pole) and the lamp base (- pole).

Voltage in:	6 km/h wheelchair	= 24 V
	10 km/h wheelchair (abroad)	= 24 V
	10 km/h wheelchair (Germany)	= 12 V

CAUTION:
 Avoid bridging the poles by all means.
>Danger of Fire and Burning<.

- Insert the new light bulb.

Type of flasher lamp:	
6 km/h wheelchair	= 24 V / 21 watts
10 km/h wheelchair (abroad)	= 24 V / 21 watts
10 km/h wheelchair (Germany)	= 12 V / 21 watts

Type of rear light lamp:	
6 km/h wheelchair	= 24 V / 5 watts
10 km/h wheelchair (abroad)	= 24 V / 5 watts
10 km/h wheelchair (Germany)	= 12 V / 5 watts

- Check whether the contact of the casing fits exactly to the positive pole of the light bulb.

✓ **NOTE:**
The contact fits correctly, if a slight pressure is to be applied when inserting the light bulb.

- Lock the light bulb by slightly pressing down and turning by a 1/8th revolution to the right.
- Mount the rear light glass.
- Fix the rear light glass by means of the fastening screws.

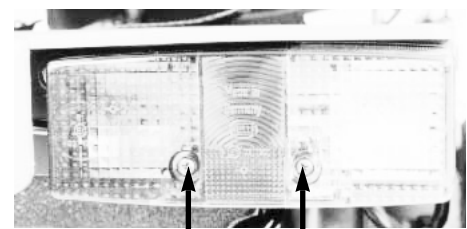
Disassembling Rear Light

- Remove rear light glass and lamps as described above.
- Mark plug and pull out.
- Loosen screws with nuts and washers completely.
- Remove rear light from the rear light board.

Montage

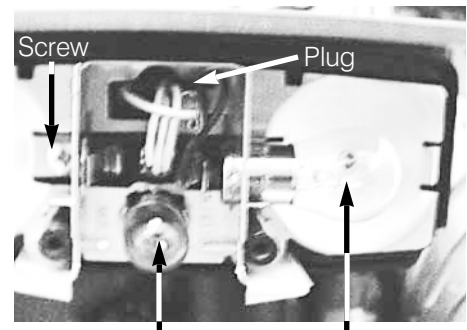
- The assembly is performed in the reverse order.

Removing Rear Light Glass



Fastening screws

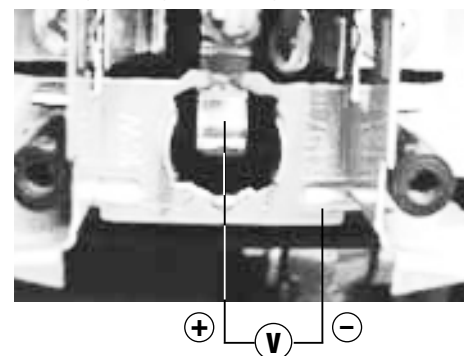
Removing Light Bulb



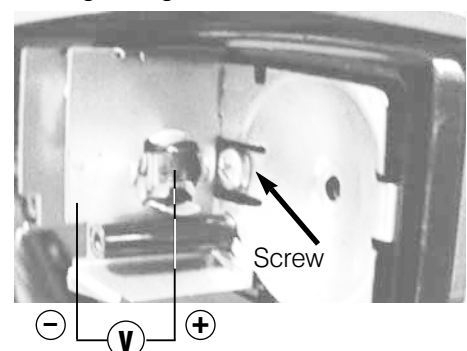
Rear Light

Flasher

Testing voltage: rear light



Testing Voltage: Flasher



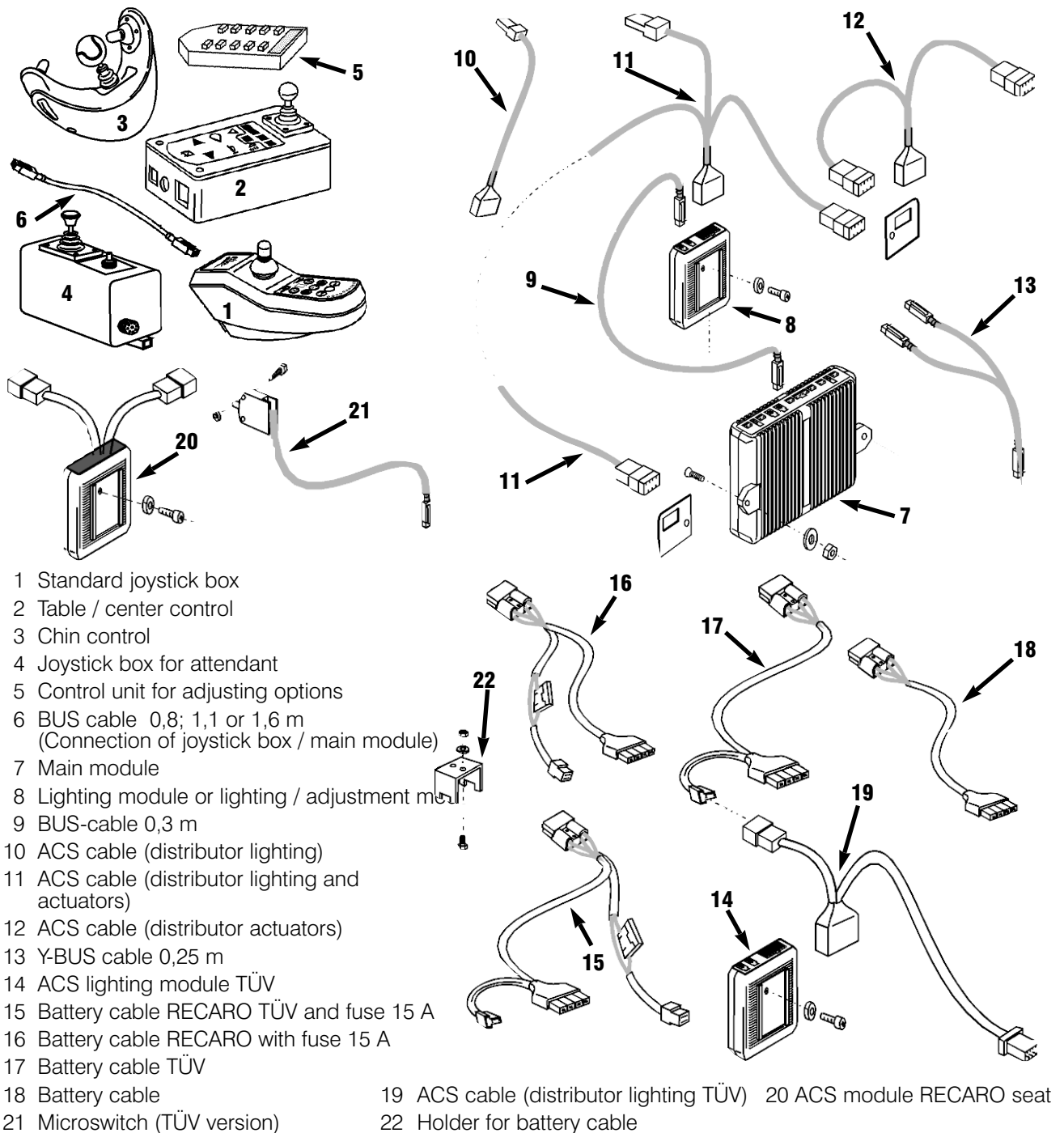
CAUTION:

The batteries must be removed first
before detaching the rear lights.
>Danger of Short Circuit, Fire and Burning<.

16.0 Check Work on the Driving Electronics (Testing of Modules)

16.1 General

Overview of the electronic modules and cables



The equipment of the wheelchairs with joystick box, electronic modules and corresponding cables depends on the respective type of wheelchair. The most simple type, for example, is equipped with the following:

- Main module (7)
- Battery cable (18)
- BUS cable 0,8 m (6)
- Joystick box (1, 2 or 3)

All modules and control devices are to a large extent maintenance-free. That is why only basic tests can be performed on them. Joystick boxes (1, 2 and 3) are equipped with status displays, from which error messages can be read in the form of flashing-codes. The electronic modules, too, have status displays, however, these show only if the respective module is operative. Defective modules must be replaced and must be sent to the INVACARE-Service Department.

16.2 Testing Joystick Boxes



NOTE:

- Before inspecting the joystick boxes, check the charging status of the batteries.
- Then check status display for error codes.

Inspection

- Status display flashing?
- BUS plug defective?
- BUS cable damaged?
- Joystick tight or damaged?
- Joystick box fastening damaged?
- Displays or key pad defective?
- Power supply to the joystick box defective?
(For measuring see below.)

Remedy

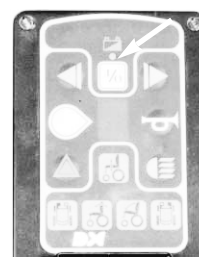
- > Check error codes. See chapter 8.0.
- > Replace BUS cable.
- > Replace BUS cable.
- > Replace joystick box.
- > Renew wing screws, replace holding device, if necessary.
- > Replace joystick box.
- > Check:
Battery charge, BUS plug, BUS cable, main module

Joystick Boxes

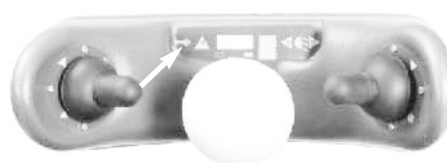
Standard joystick box



Table, centre control



Chin control



Checking Power Supply to Joystick Box

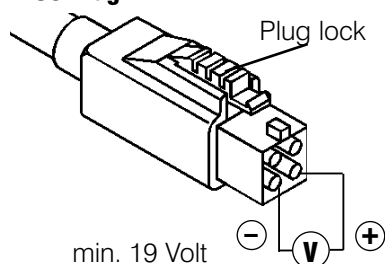
- Pull BUS plug from the joystick box.
- Measure voltage at the contacts indicated (see drawing).
The voltage must amount to at least 19 V.



CAUTION:

Do not bridge contacts. Danger of Short Circuit.

BUS Plug



Malfunction	Cause	Remedy
• No voltage?	- BUS cable defective. - BUS cable defective. - Main module defective.	> Test / replace BUS cable. (Chapter 18.0) > Test / replace BUS cable. (Chapter 18.0) > Test main module. (Chapter 16.3) - Test voltage supply to main module. (Chapter 16.3) > Test battery. (Chapter 12.2)
• Voltage below 19 V?	- Battery fully discharged.	



NOTE:

The following inspections are to be performed at the attendant's joystick box (additional joystick box - switchable)

- Check whether the control can be switched over by means of the flip switch.
- Check whether the final speed can be pre-selected by means of the controller .
- Check whether the wheelchair can be controlled via the joystick.
- Check whether all other functions (lighting and adjustment functions) continue to be controllable via the main joystick box.



NOTE:

- When ordering a replacement joystick box, the part numbers and the number of the software version must be indicated.
- The software version number can be found on a sticker at the joystick box.

16.3 Testing the Main Module



NOTE:

- The main module is maintenance-free. Only basic tests can be performed.
- The module is located in front under the splash protection at the battery box retainer.
- Prior to the testing make sure that the batteries are charged.

Status Display

For a simple optical error determination, the module is equipped with a green LED for status display.

Inspection of the status display:

- Switch the wheelchair on via the joystick box.
- Inspect LED (see table below).

Inspection

- Status display glowing?
- Status display off?
- Status display flashing?

Remedy

- > Module is all right.
- > Check the voltage supply of the module.
Check programming.
- > Replace module.

Testing Preparation

- Remove batteries. See chapter 12.1 in this respect.
- Remove splash protection. See chapter 11.7 in this respect.
- Install battery boxes.

Testing Voltage Supply to Main Module

- Remove the plug of the battery cable from the main module.
 - Measure the voltage existing at the voltage supply contacts (see drawing).
- All combinations between the positive and the negative poles must be measured.
- The voltage between the positive and the negative poles must each amount to at least 19 volts.



NOTE:

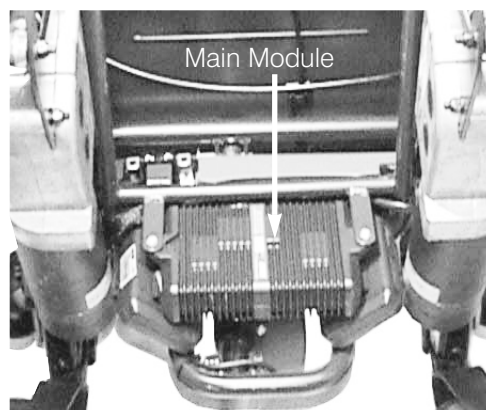
Information on the use of the multimeters can be taken from the respective User's Manual.



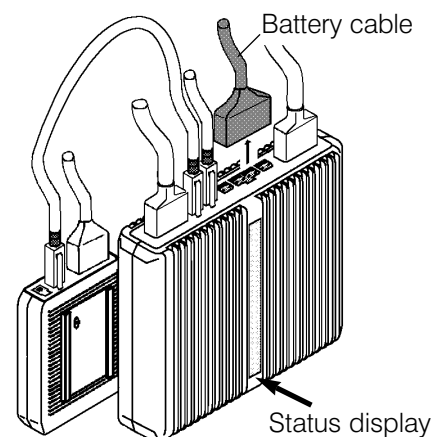
CAUTION:

*Avoid by all means a bridging of the voltage supply contacts.
>Danger of Fire and Burning<.*

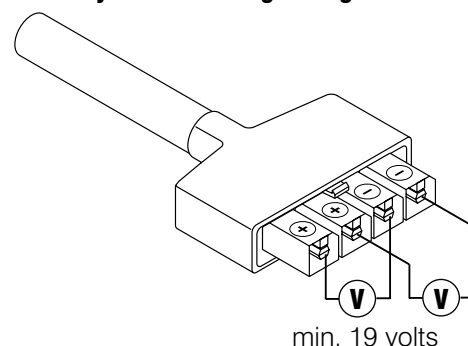
Main Module, assembled



Main Module, disassembled



Battery Cable: Testing Voltage



Malfunction	Cause	Remedy	Chapter
No voltage at the contacts?	External battery contacts defective. Master fuse defective.	Check external contacts. Check master fuse (50 A).	12.1 12.1
Voltage below 19 V?	Battery fully discharged.	Pre-charge battery. Replace battery.	12.2 12.0

16.4 Testing Lighting or Lighting / Adjustment Modules



NOTE:

- The lighting / adjustment modules are maintenance-free. Only basic tests can be performed.
- The modules are located in front under the splash protection at the battery box retainer.
- Prior to the inspection, make sure that the batteries are charged.

Status Display

For a simple optical error diagnosis, the modules are equipped with LEDs for status display.

Inspecting the status display:

- Switch on wheelchair at the joystick box.
- Inspect LEDs (see table below).

Inspection

- Status display glowing? > Module all right.
- Status display off? > Test voltage supply of the module.
Test programmer.
- Status display flashing? > Replace module.

> Testing Preparations

- Remove battery boxes. See chapter 12.1 in this respect.
- Remove splash protection. See chapter 11.7 in this respect.
- Install battery boxes.

Checking Power Supply from the Main Module to the 24 V / 12 V Lighting Module or to the Lighting / Adjustment Module

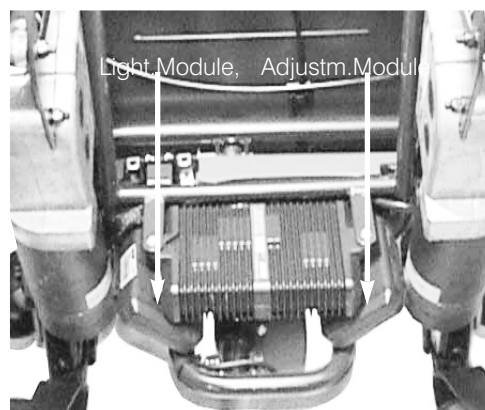
- Remove the BUS plug of the connection cable from the main module to the 24 V / 12 V lighting module or to the lighting / adjustment module respectively.
- Measure the voltage existing at the contacts of the power supply (see drawing).
It must amount to at least 19 volts.



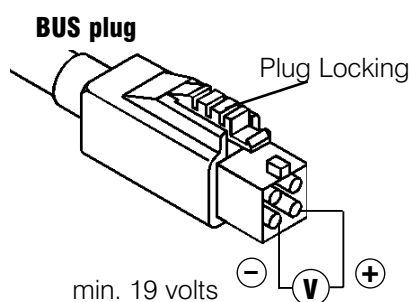
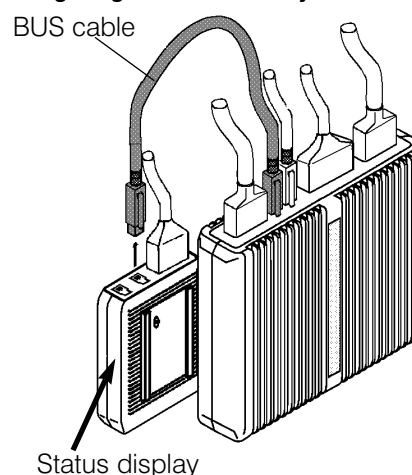
CAUTION:

Avoid by all means to bridge the contacts of the voltage supply.
>Danger of Fire and Burning<.

Lighting Module and Adjustment Module, assembled



Lighting Module and Adjustment Module



Malfunction	Cause	Remedy	Chapter
No voltage at the contacts?	Fuse in main module blown.	Interrupt testing and resume testing after a few seconds.	
	BUS cable defective.	Check / replace BUS cable.	18.0
	Main module defective.	Check / replace main module.	16.3/17.0
	Power supply to main module interrupted.	Check power supply. Check master fuse (50 A).	12.0 12.0
Voltage below 19 V?	Battery fully discharged.	Pre-charge battery. Replace battery.	12.2 12.0

16.5 Testing Additional Power Supply of the 12 V Lighting Module (TÜV Version)



NOTE:

- If required, test model first according to the description given >in chapter 16.4.

Testing Preparations

- Remove battery boxes. See chapter 12.1 in this respect.
- Remove splash protection. See chapter 11.7 in this respect.
- Install battery boxes.

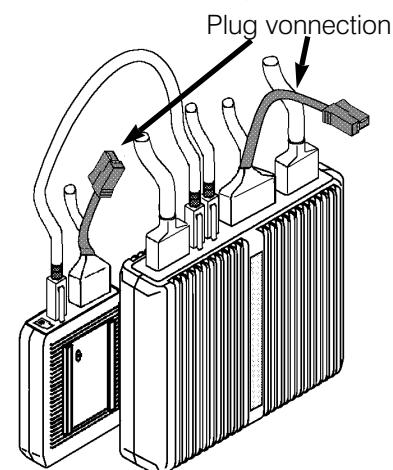
- Detach the plug connection from the battery cable to the 12 V lighting module.
- Measure the voltage existing at the contacts of the feeder cable (see drawing).
It must amount to at least 19 volts.



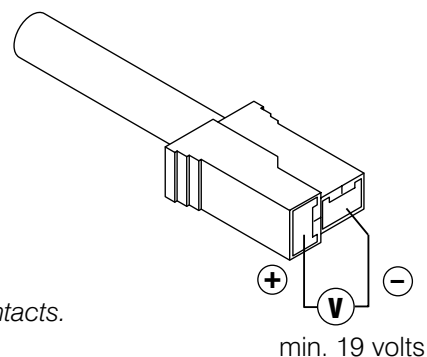
CAUTION:

*Avoid by all means a bridging of the power supply contacts.
>Danger of Fire and Burning<.*

Main Module and 12 V Lighting Module



Additional Cable: Testing Voltage



Malfunction	Cause	Remedy	Chapter
No voltage at contacts?	Power supply to the plug of the main module interrupted.	Check / replace cable. Check power supply. Test master fuse (50 A).	18.0 12.0 12.0
Voltage below 19 V?	Battery fully discharged.	Pre-charge battery. Replace battery.	12.2 12.0

16.6 Testing Voltage Transformer for RECARO Seat

Testing Preparations

- Remove battery boxes. See chapter 12.1 in this connection.
- Remove splash protection. See chapter 11.7 in this connection.
- Install battery boxes.

Testing Voltage on Voltage Transformer for RECARO seat

- Detach plug connection from the battery cable to the voltage transformer.
- Measure the voltage existing at the contacts of the feeder cable (see drawing). It must amount to at least 19 volts.
- Reconnect the plugs.
- Detach the plug connection to the RECARO seat.
- Measure the output voltage.
Depending on the charging status of the batteries, it must amount to between 2.5 and 4 volts.



NOTE:

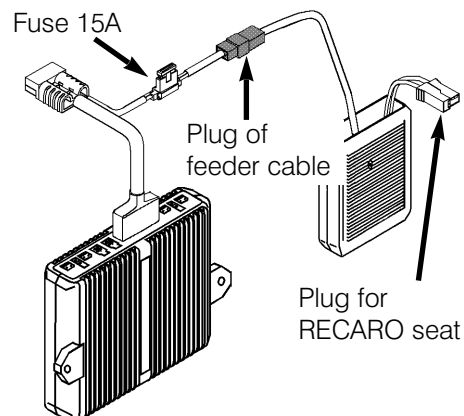
The voltage transformer provides an output voltage of 12 volts only under load (seat connected and switched on). In conditions without load, only a level of between 2.5 and 4 volts is to be measured.



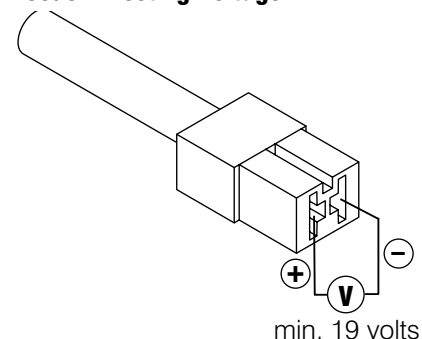
CAUTION:

Avoid by all means bridging the contacts of the power supply.
>Danger of Fire and Burning<.

Main Module and Voltage Transformer



Feeder : Testing Voltage



Malfunction	Cause	Remedy	Chapter
No voltage at the feeder cable?	Feeder cable defective. Fuse (15 A) defective. Power supply to the main module is interrupted.	Check / replace feeder cable. Replace fuse. Check voltage supply. Check master fuse (50 A).	18.0 12.1 12.1
Voltage below 19 V?	Battery fully discharged.	Pre-charge battery. Replace battery.	12.2 12.0
Output voltage higher than 4 volts and lower than 2.5 volts?	Voltage transformer defective.	Replace voltage transformer.	17.7

16.7 Testing Microswitch

Testing Preparations

- Lift the seat and lock, if necessary.
- Remove splash protection.
- Fold rear light board upwards to uncover microswitch for switching.

Testing Microswitch

- Remove the plug of the BUS cable from the socket board of the 12 V lighting module.

✓ **NOTE:**
Press down plug lock as otherwise the plugs will be damaged.

✓ **NOTE:**
Information on the use of the multimeter can be taken from the relevant User's Manual.

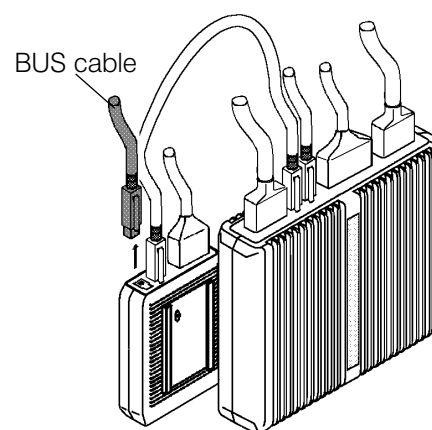
- Set the multimeter to continuity test.
- Measure on the contacts of the BUS plug while the switch is not being activated. The measuring device must show continuity.
- Activate the switch and measure again on the contacts of the BUS plug. The measuring device is not to show any continuity.

Malfunction	Cause	Remedy
No continuity while switch is not activated?	Cable parted. Microswitch defective.	Replace microswitch and cable.
Continuity while switch is activated?	Short Circuit in the microswitch.	Replace microswitch and cable.

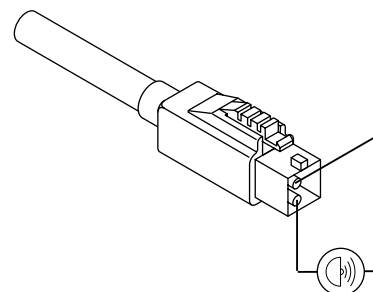
Microswitch, complete



Main Module and 12 V Lighting Module



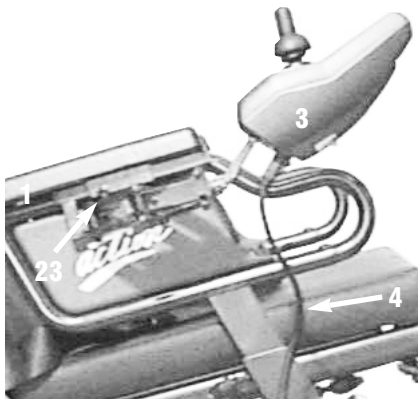
Continuity Test on the Plug



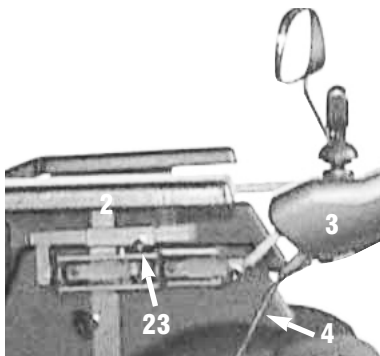
17.0 Repair Work on the Driving Electronics (Replacing Modules)

17.1 Standard Joystick Box

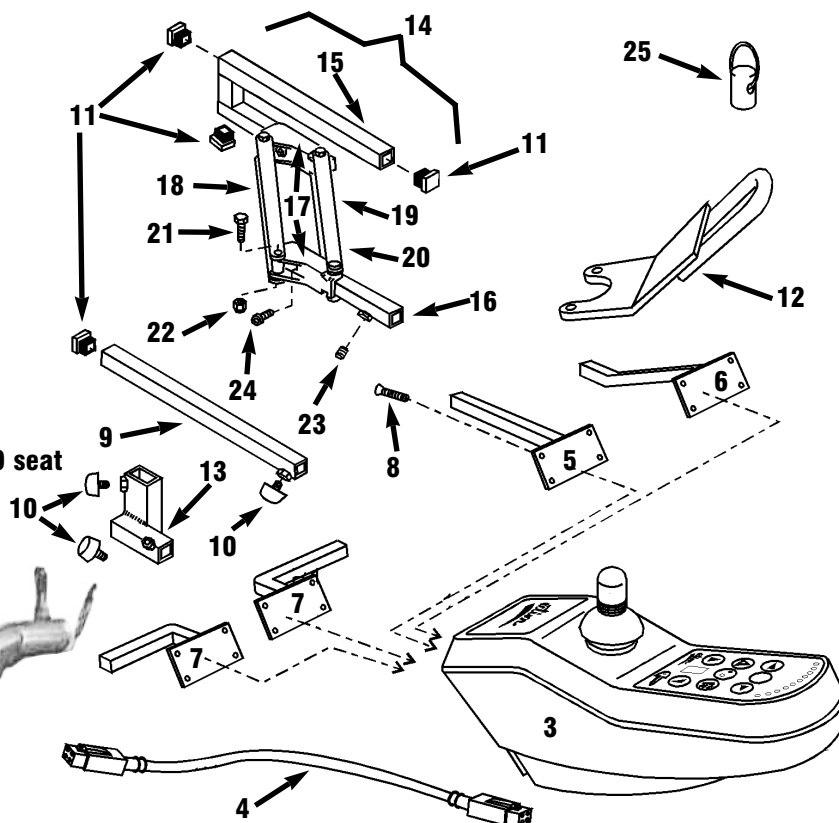
Joystick box, mounted to the standard seat



Joystick box, mounted to the RECARO seat



Joystick box and fixing devices, disassembled



- | | | |
|---|--|----------------------------------|
| 1 Armrest, Standard | 2 Armrest, RECARO | 3 Joystick box |
| 4 BUS cable | 5 Joystick box holder, Standard | 6 Holder joystick box swivable |
| 7 Holder, joystick box for attendant | 8 4x Screw M4x10 | 9 Joystick box support bar |
| 10 Wing screw M6x10 | 11 Slide piece 15x15 | 12 Guard bow, ACS joystick box |
| 13 Joystick box receptacle, RECARO seat | 14 Joystick box, swivable | 15 Guide piece 1 |
| 16 Guide piece 2 | 17 2x Bracket | 18 2x lever 1 |
| 19 1x Lever 2 | 20 1x Lever 2 with pressure piece, resilient 8mm | 21 4x Screw M5x40 |
| 22 4x Lock nut M5 | 23 2x Set screw M6x6 | 24 2x Phillips screw 4,8x16 |
| 25 Magnetic key | 26 Holder for attendant | 27 Holder for attendant (RECARO) |
| 28 2x Clamping piece | 29 4x Screw M6x35 | 30 Holder for attendant |
| 29 4x Lock nut M6 | | |

Inspection

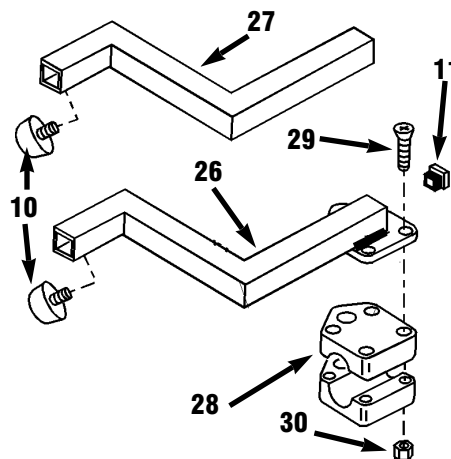
- Check electric functions
- BUS plug defective?
- BUS cable damaged?
- Joystick tight or damaged?
- Screwings loose?
- Parts or fixing device completely defective?

Remedy

See chapter 16.2.

- > Replace BUS cable.
- > Replace BUS cable.
- > Replace joystick box
- > Tighten screws.
- > Replace screws, replace parts or fixing device, if necessary.

Joystick box holding devices for attendant



Disassembly joystick box

- Detach BUS cable from (4) joystick box (3).
- Loosen set screw (23) at joystick box holder (14) and wing screw (10) at joystick box stay bar (9) and detach joystick box (3).
- Loosen four screws (8) completely and remove together with holder (5, 6 or 7) from the joystick box (3).
- If required, loosen two screws and detach guard bow (12) from the joystick box (3).

Assembly

- The assembly is performed in reverse order.

Disassembly joystick box support bar and joystick box receptacle

- Detach joystick box (3) as described above.
- Loosen set screw (23) at the armrest (1 and 2 respect.) and detach joystick box support bar.
- If necessary, remove slide piece (11) by means of a screwdriver.

Only in RECARO seat

- Loosen wing screw (10) at armrest (2) and detach joystick box receptacle (13).

Assembly

- For the assembly proceed in the reverse order.

Disassembly joystick box holder (swivable)

- Detach joystick box (3) as described above.
- Loosen set screw (23) at the armrest (1 and 2 respect.) and detach joystick box holder.
- Loosen four nuts (22), detach screw (21) and four levers (18, 19 and 20) from the brackets (17).
- Loosen two Phillips screws (24) and remove guide pieces (15 and 16) from the brackets (17).
- If necessary, remove slide pieces (11) from the guide pieces (15 and 16) by means a screwdriver.

Assembly

- The assembly is performed in the reverse order.



NOTE:

When assembling make sure that the lever with the pressure piece (20) is installed in such a way that the guide piece (16) can lock into place when swivelled.

Disassembly joystick box holder for attendant

- Detach joystick box (3) as described above.

Recaro seat:

- Loosen screw at push handle and detach holder (27).

Standard / Comfort seats

- Loosen nuts (30) and detach holder (26) completely with clamps (28) and screws (29) from the backrest.

- If necessary, remove slide piece (11) by means of a screw driver.

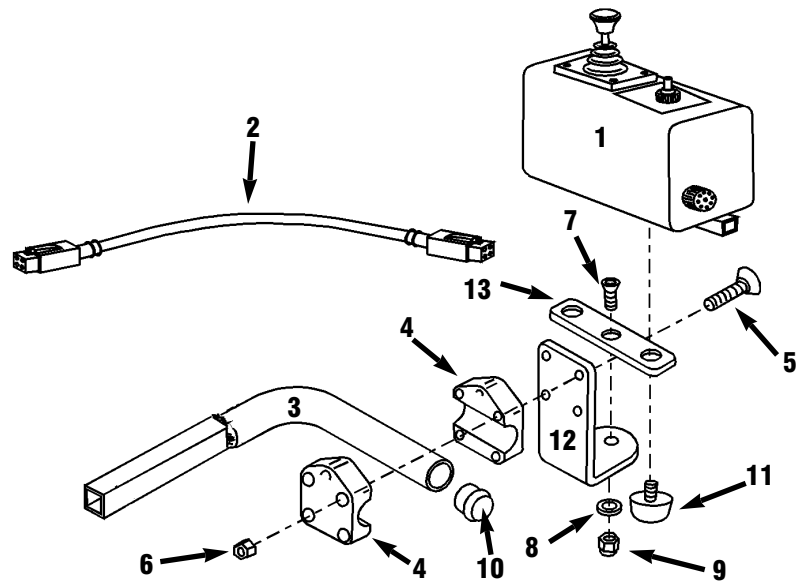
Assembly

- The assembly is performed in the reverse order.

17.2 Joystick Box for Attendant

- 1 Joystick box for attendant
- 2 BUS cable
- 3 Holder for RECARO seat
- 4 2x Clamping piece
- 5 4x Screw M6x35
- 6 4x Lock nut M6
- 7 Screw M6x16
- 8 Washer 6,4x12,5x1,6
- 9 Cap lock nut M6
- 10 Slide piece SL 22
- 11 2x Wing screw M6x10
- 12 Mounting angle
- 13 Holding plate

Joystick Box with Fixing Devices, disassembled



Inspection

- Check electrical functions!
- BUS plug defective?
- BUS cable damaged?
- Joystick tight or damaged?
- Screwings loose?
- Parts or holding device completely defective?

Remedy

- See chapter 16.2.
- > Replace BUS cable.
 - > Replace BUS cable.
 - > Replace joystick box.
 - > Tighten screws.
 - > Replace screws, replace parts or holder, if required.



NOTE:

- In the Recaro seat, the joystick box (1) with holder (3) is attached to the push handle.
- In the remaining models, the joystick box (1) with clamping piece(4) is directly attached to the backrest.

Disassembly joystick box

- Detach BUS cable (2) from the joystick box (1).
- Loosen wing screws(11) and detach joystick box (1).

Assembly

- The assembly is performed in the reverse order.

Disassembly joystick box holder

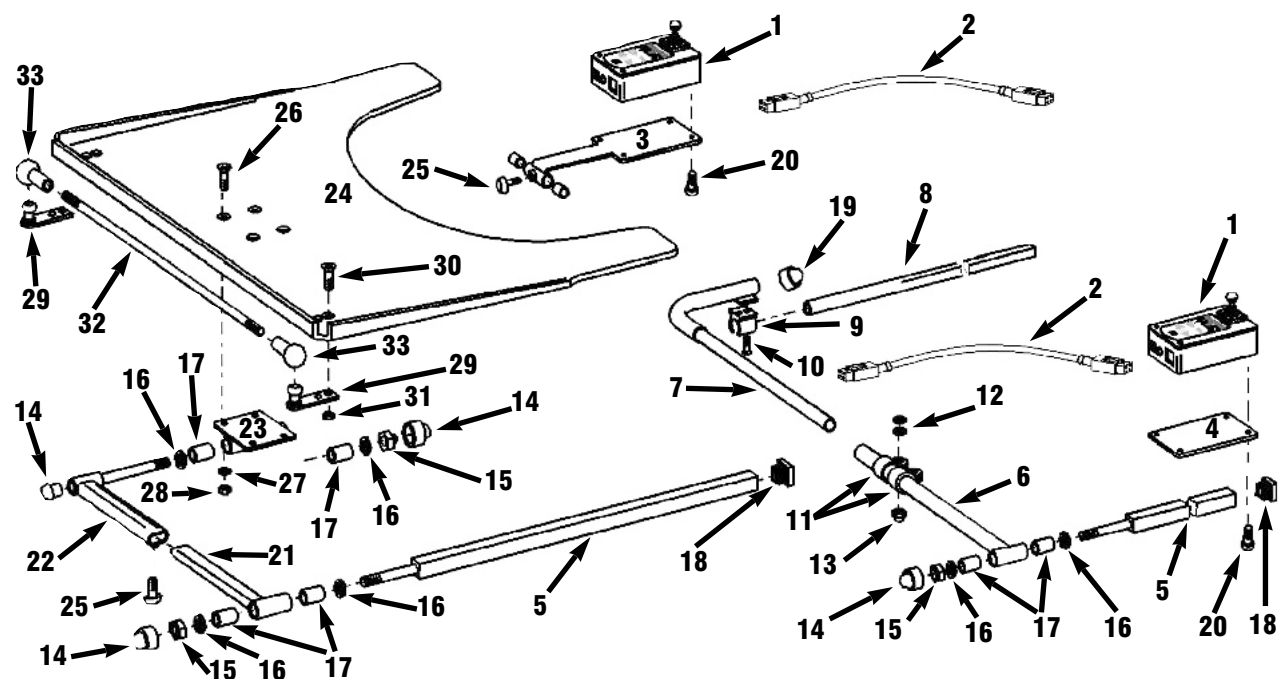
- Detach joystick box (1) as described above.
- Loosen nut (9) and detach, together with washer (8), screw (7) and holding plate (13), from the mounting (12) angle.
- Loosen 4 nuts (6) and detach, together with screws (7), mounting angle (12) and clamping pieces (4), from the holder (3) or from the backrest, respectively.
- In the Recaro seat, loosen screw and detach holder (3) from the push handle.
- If necessary, remove slide piece (10).

Assembly

- The assembly is performed in the reverse order.

17.3 Table Control / Central Control

Table / Central Control and Fixing Devices, disassembled



- | | | |
|-------------------------------------|----------------------------|----------------------------|
| 1 Joystick box | 2 BUS cable, 1,6 m | 3 Holder for table control |
| 4 Holding plate for central control | 5 Guide rod | 6 Swivel arm |
| 7 Support arm | 8 Carrier rod | 9 Clamping piece PVC |
| 10 2x Phillips screw M5x12 | 11 2x Clamping piece | 12 4x Washer 8,4x 17x1,6 |
| 13 2x Lock nut M8 | 14 Cap SKS 12 | 15 Lock nut M12 |
| 16 2x Washer 13x24x2,5 | 17 2x Bushing RD 19x3,5x25 | 18 Slide piece 15x15 |
| 19 2x Slide piece SL 22 | 20 4x Screw M4x10 | 21 Swivel arm part 1 |
| 22 Swivel arm part 2 | 23 Support plate for table | 24 Acrylic table 660x540x8 |
| 25 Wing screw M6x10 | 26 4x Phillips screw M6x20 | 27 4x Washer 6,4x12,5x1,6 |
| 28 4x Cap lock nut M6 | 29 2x Holder for guide rod | 30 4x Screw M5x22 |
| 31 4x Lock nut M5 | 32 Guide rod M8x560 | 33 2x Angle joint M8 |

✓ NOTE:

- The joystick box and a number of fixing parts are identical in the table control as well as in the central control.
- The central control is available in versions for left-handers and for right-handers.
- In the central control, an adapter for options, consisting of an adapter and a joystick box support bar with screws, can be mounted additionally.

Inspection

- Check electric functions!
- BUS plug defective?
- BUS cable damaged?
- Joystick tight or damaged?
- Screwings loose?
- Parts or holder completely defective?
- Table damaged?

Remedy

- See chapter 16.2.
- > Replace BUS cable.
- > Replace BUS cable.
- > Replace joystick box.
- > Tighten screws.
- > Replace screws, replace parts or holder, if necessary
- > Replace table and/or parts.

Disassembly joystick box

- Detach BUS cable (2) from the joystick box (1).
- Loosen screws (20) and detach joystick box (1) from its holder (3) or from its holding plate (4), respectively.

Assembly

- The assembly is performed in the reverse order.

Disassembly of the holder for the central control

- Detach joystick box (1) as described above.
- Disengage the clamping piece (9) at the carrier rod (8) and fold away the support arm (7) together with the swivel arm (6).
- Loosen set screws (not shown) at upper part of the side pieces and remove carrier rod (8) and swivel arm (6) completely from the wheelchair.
- Loosen nuts (13) and pull support arm (7) from the swivel arm (6).
- Detach holding plate (4) with washers (12) und pull the clamping pieces (11) from the swivel arm (6).
- Remove cap(14), loosen nut (15) and detach.
- Detach swivel arm (6) with washers (16) and bushes (17) from the guide rod (5).
- Loosen screws (10) and detach clamping piece (9) from the support arm (7).
- If required, detach slide pieces (18 and 19).

Assembly

- The assembly is performed in reverse order.



NOTE:

- During the assembly make sure to insert the bushes (17) and washers (16) correctly into the swivel arm (6).

Disassembly of table plate and holder

- Detach joystick box (1) as described above.
- Loosen nuts (28) and remove together with washers (27) and screws (26).
- Detach table plate (24) with guide rod (32) from the receiving plate (23).
- Loosen nut (31)and remove together with screws (30).
- Separate guide rod (32) from the table plate (24).
- Separate holder (29) from the angle joints (33).
- Mark the position of the angle joints (33) and unscrew the joints from the guide rod (32).
- Loosen wing screw (25) and remove holder (3) from the guide rod (32).
- Loosen set screw (not shown) at the upper part of the side part and detach the guide rod (5) together with the swivel arms (21 and 22) completely from the wheelchair.
- Loosen wing screw (25) and separate the swivel arms (21 and 22) from each other.
- Remove cap (14) at swivel arm (21), loosen nut (15) and detach.
- Detach swivel arm (21) with washers (16) and bushes (17) from the guide rod (5).
- Remove cap (14) on the swivel arm (22), loosen nut (15) and detach.
- Remove support plate (23) with washers (16) and bushes (17) from the swivel arm (22).
- If necessary, remove slide pieces (18 and 19).



NOTE:

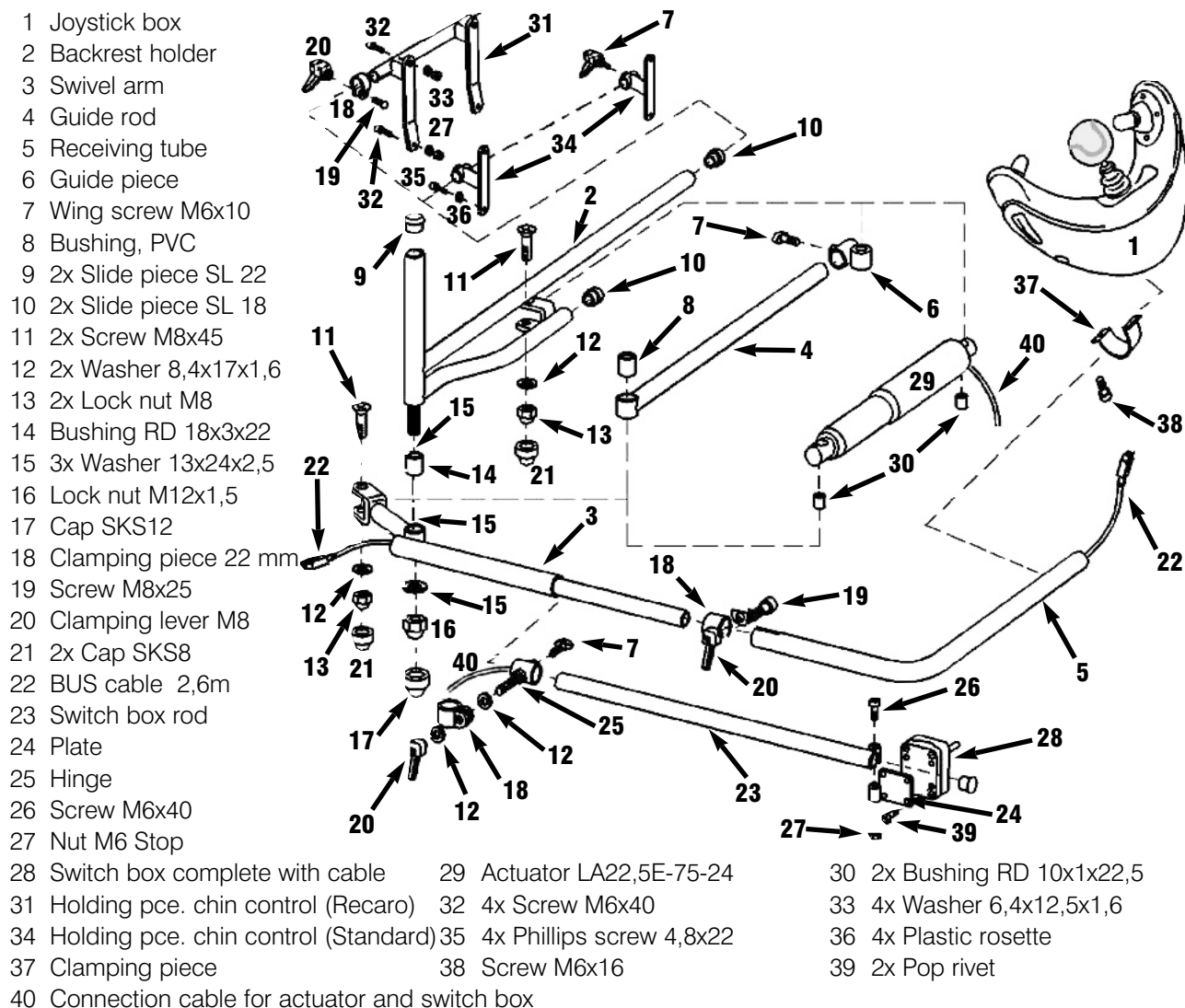
- While assembling make sure that the bushes (17) with washers (16) are inserted correctly into the swivel arm (21) and the support plate (23), respectively.
- The angle joints (33) are to be mounted to the guide rod (32) in such a way that allows the table plate (24) to be screwed together with the holder 29).

Assembly

- The assembly is performed in reverse order.

17.4 Chin Control, Manually / Electrically Swivable in Horizontal Direction

Chin control, disassembled



NOTE:

- In the manual version, the joystick box (1) is swiveled by means of the guide rod (4).
- In the electric version, the joystick box (1) is swiveled by means of the actuator (29).
- Guide rod or actuator, resp., are connected to the backrest holder (2) and the swivel arm (3).
- A large part of the components are used in both versions.
- In the electric version, the switch box (28) with switch box rod (23) is employed additionally.
- The switch box (28) is riveted to the plate (24) and must be replaced completely together with the cable.
- For the Standard / Comfort seat, another holder is available besides the model (34) shown above. It consists of two clamping halves with bushes and screw and is to be attached to the tube frame of backrest.

Inspection

- Check electric functions on the joystick box!
- BUS plug defective?
- BUS cable damaged?
- Joystick tight or damaged?
- Screwings loose?
- Holder defective?
- Actuator defective?
- Switch box damaged?

Remedy

- See chapter 16.2.
- > Replace BUS cable.
 - > Replace BUS cable.
 - > Replace joystick box..
 - > Tighten screws.
 - > Replace parts or holder.
 - > Replace actuator motor.
 - > Replace switch box.



NOTE:

- A continuity test can be performed at the actuator motor.
- Also, a performance test can be conducted by applying a voltage (24 V).
- The tests are to be performed as-described in chapter 14.0 for the actuator motors.

Disassembly Joystick Box

- Detach BUS cable (22) from the joystick box (1).
- Loosen screw (38), open clamp (37,) and detach joystick box (1) from the receiving tube (5).

Assembly

- The assembly is performed in the reverse order.

Disassembly Actuator

- Detach actuator connection cable (40) from the wheelchair and put aside.
- Remove caps (21), loosen nuts (13) completely and detach together with washers (12).
- Support actuator (29), remove screws (11) and detach actuator from the backrest holder (2) and from the swivel arm (3).



NOTE:

Assembly

- The assembly is performed in the reverse order.
- The guide rod (4) is to be dismantled in a similar way.
- The guide piece (6) can also be removed from the guide rod (7) after loosening the wing nut.
- Do not forget the bushing (8) when assembling.

Disassembly Switch Box

- Detach connection cable (40) from the wheelchair and put aside.
- Loosen nut (27) completely and detach together with screw (26).
- Detach switch box (28) from the switch box rod (23).
- If required, loosen the wing screw (7) and detach the switch box rod (23).

Assembly

- The assembly is performed in reverse order.

Disassembly Holder, complete

- Detach joystick box (1) as described above.
- Remove actuator (29) and guide rod (4) as described above.
- If required, remove switch box (28) and switch box rod (23) as described above.
- Loosen clamping lever (20) and remove together with screw (19) and washer (12) from the receiving tube (5).
- Detach receiving tube (5) with clamps (18) carefully from the swivel arm (3) while uncovering the BUS cable (22).
- Remove BUS cable (22) completely from the swivel arm (3) and detach from the wheelchair.
- Remove cap (17), loosen nut (16) and detach swivel arm (3) with bushing (14) and washers (15) from the backrest holder (2).
- Loosen wing screws (7) or clamping lever (20), respectively, and detach backrest holder (2) from the holding devices (31 or 34 respectively).

Recaro seat:

- Loosen 4 nuts (27) and detach together with washers (33).
- Remove screws (32) and detach holding device (31) from the seat.

Standard / Comfort seat:

- Loosen Phillips screws (35) and detach holding device (34) together with rosettes (36) from the backrest.

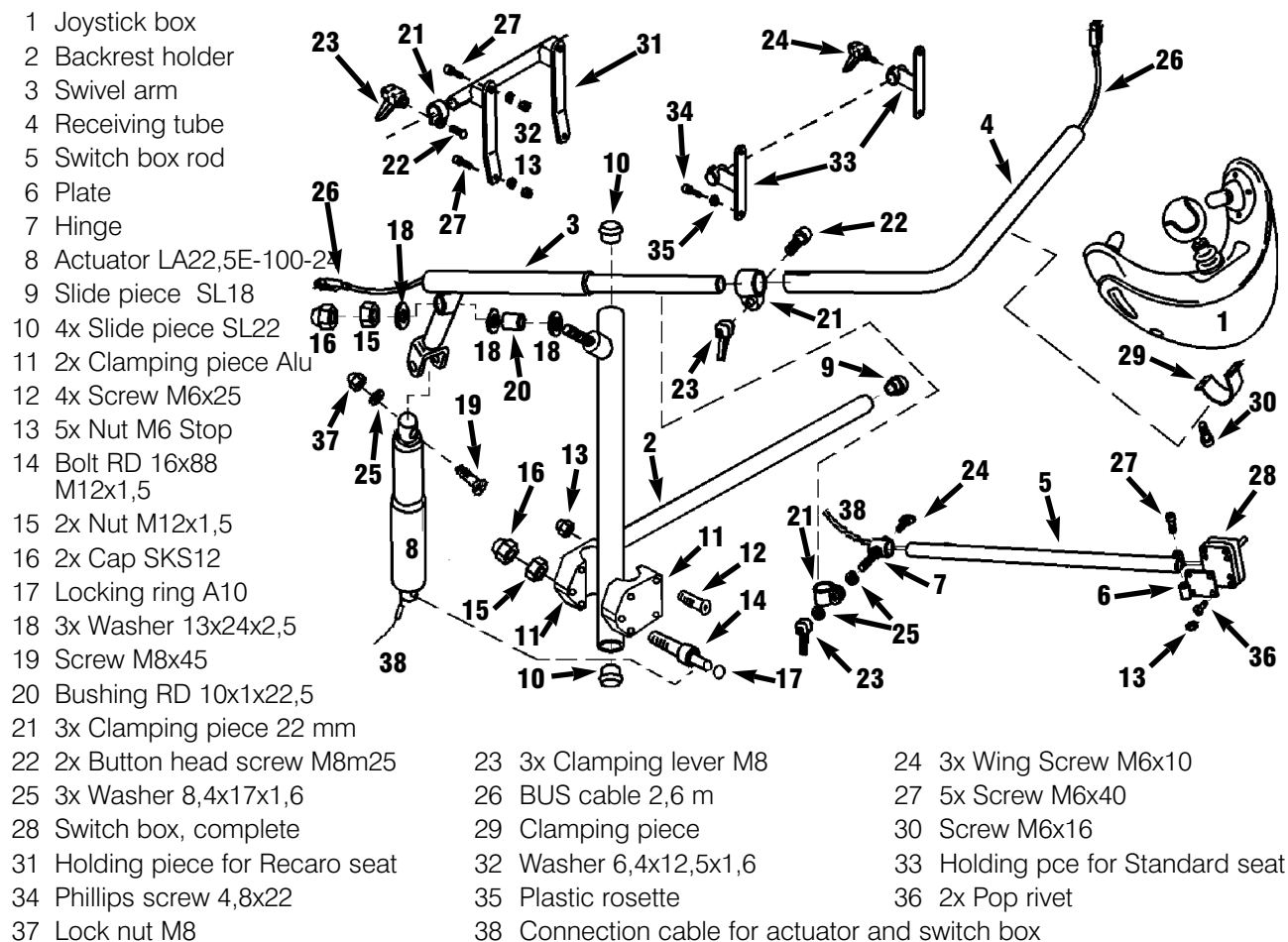
- If necessary, remove slide pieces (9 and 10 respectively).

Assembly

- The assembly is performed in reverse order.

17.5 Chin Control, Electrically Swivable in Vertical Direction

Chin Control and Holding Devices, disassembled



✓ NOTE:

- The joystick box (1) is swiveled by means of the actuator (8).
- The actuator is borne by the bolt (14) and by the swivel arm (3).
- The switch box (28) is riveted to the plate (6) and must be replaced completely with cable.
- Besides the above shown type (33), another holding device is available for the Standard/Comfort seat, consisting of two clamp halves with bushings and screw, which is to be fixed to the backrest tube frame.

Inspection

- Test electrical functions on the joystick box!
- BUS plug defective?
- BUS cable damaged?
- Joystick tight or damaged?
- Screwings loose?
- Parts or holder completely defective
- Actuator defective?
- Switch box damaged?

Remedy

- See chapter 16.2.
- > Replace BUS cable.
 - > Replace BUS cable.
 - > Replace joystick box.
 - > Tighten screws.
 - > Replace parts or holder.
 - > Replace motor.
 - > Replace switch box.

✓ NOTE:

- A continuity check can be performed on the motor.
- Also, a performance test can be conducted by applying a voltage (24 V).
- The tests must be performed according to the description on actuators contained in chapter 14.0.

Disassembly Joystick Box

- Detach BUS cable (26) from the joystick box (1).
- Loosen screw (30), open clamp (29) and detach joystick box (1) from the receiving tube (4).

Assembly

- The assembly is performed in the reverse order.

Disassembly Motor

- Detach actuator connection cable (38) from the wheelchair and put aside.
- Remove locking ring (17) from the bolt (14) to separate the actuator (8) from the backrest holder (2).
- Loosen nut (37) completely and detach together with washer (25).
- Support actuator (8), remove screw (19) and detach the actuator from the swivel arm (3).

Assembly

- The assembly is performed in the reverse order.

Disassembly Switch Box

- Detach connection cable (38) from the wheelchair and put aside.
- Loosen nut (13) completely and detach together with screw (27).
- Detach switch box (28) from the switch box rod (5).
- If necessary, loosen wing screw (24) and detach switch box rod (5).

Assembly

- The assembly is performed in the reverse order.

Disassembly Holder, complete

- Remove joystick box (1) as described above.
- Remove actuator (8) as described above.
- Remove switch box (28) and switch box rod (5) as described above.
- Loosen clamping lever (23) and remove together with screw (22) and washer from the receiving tube (4).
- Detach receiving tube (4) together with clamps (21) carefully from the swivel arm (3) and clear the BUS cable (26) in the process.
- Remove the BUS cable (26) completely from the swivel arm (3) and detach from the wheelchair.
- Remove cap (16), loosen nut (15) and detach the swivel arm (3) with bushing (20) and washers (18) from the backrest holder (2).
- Detach swivel arm (3) from the backrest holder (2).
- Loosen wing screws (24) and clamping lever (23) respectively, and detach backrest holder (2) from the holding pieces (31 and 33 respectively).
- Loosen nuts (13) together with screws (12) and detach clamping piece (11) from the backrest holder (2).
- Remove cap (16), loosen nut (15) and detach bolt (14) from the clamp (11).

Recaro seat:

- Loosen 4 nuts (13) and detach together with washers (32).
- Remove screws (27) and detach holder (31) from the seat.

Standard / Comfort seat

- Loosen Phillips screws (34) and detach holder (33) with rosettes (35) from the backrest.

- If necessary, remove slide pieces (9 and 10 respectively).

Assembly

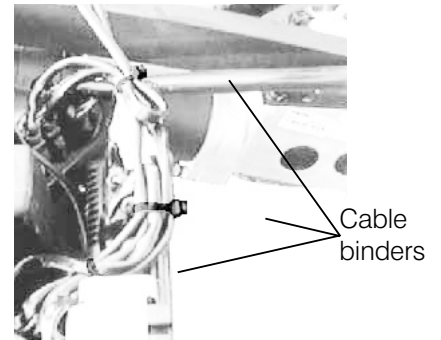
- The assembly is performed in the reverse order.

17.6 Main Module

Preparation

- Remove battery boxes. See chapter 12.1 in this respect.
- Remove splash protection. See chapter 11.7 in this respect.
- Remove cable binders located at the main module.

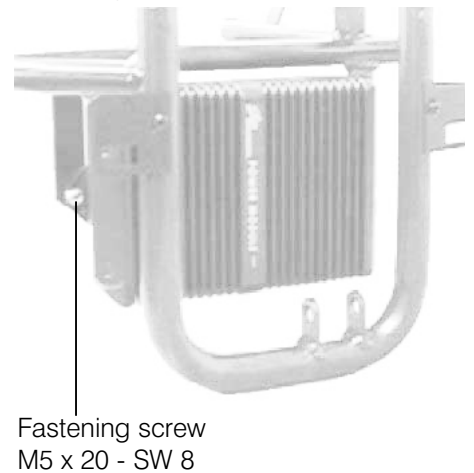
Location of the cable binders



Removing the Main Module

- Remove all plugs from the socket board of the main module.
- ✓ **NOTE:**
Press down plug lock, as otherwise the plugs will be damaged.
- Loosen the two fastening screws of the main module (SW 8 mm).
 - Pull module out of the battery box retainer in downward direction.

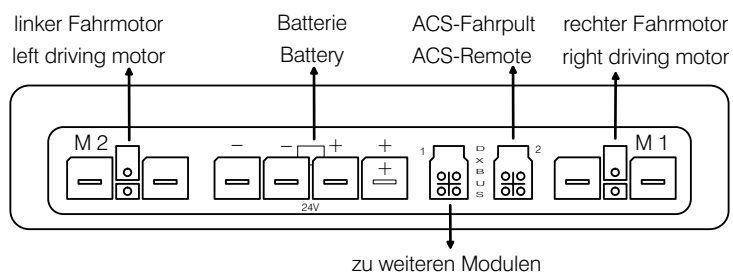
Removing the main module



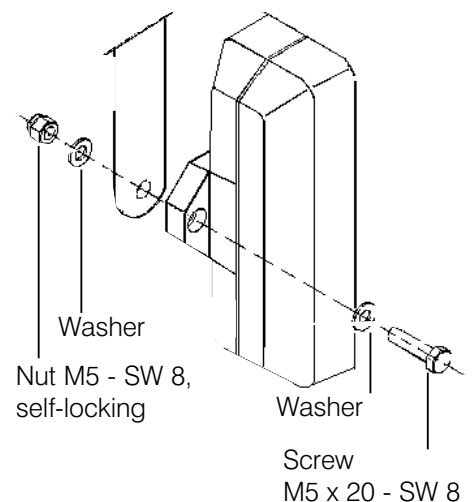
Installing the Main Module:

- Push the main module into the battery box retainer from below and fasten it by means of the two screws.
- Insert the plugs into the module's socket board .
The arrangement of the plugs can be seen from the connecting plan.
- Attach new cable binders.
- Mount the splash protection.
- Insert the battery boxes.

Connecting Plan: Main Module



Detail: Module Fastening



17.7 Lighting Module / Lighting and Adjustment Module (CLAM) and Voltage Transformer

Preparation

- Remove splash protection. See chapter 11.7 in this respect.
- Remove cable binders at connection cables.

Removing the Modules

- Remove all plugs from the socket board of the module to be replaced



NOTE:

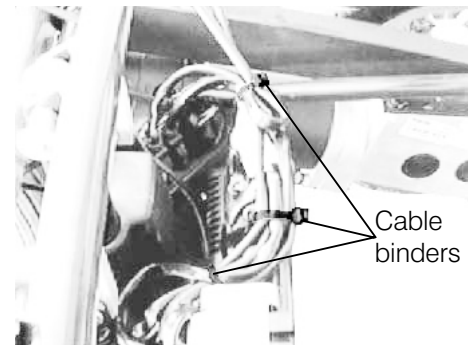
Press down plug locks, as otherwise the plug will be damaged.

- Loosen the two fastening screws of the module (SW 8 mm).
- Pull the module from the battery box retainer in downward direction.

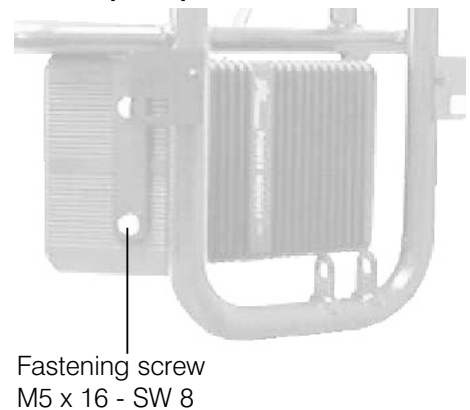
Installing the Modules

- Push the module into the battery box retainer from below and fasten it by means of the two fastening screws.
- Insert the plugs into the module's socket board. The arrangement of the plugs can be seen from the connecting plan.
- Attach new cable binders.
- Mount the splash protection.

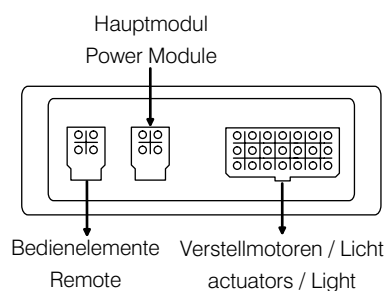
Location of the cable binders



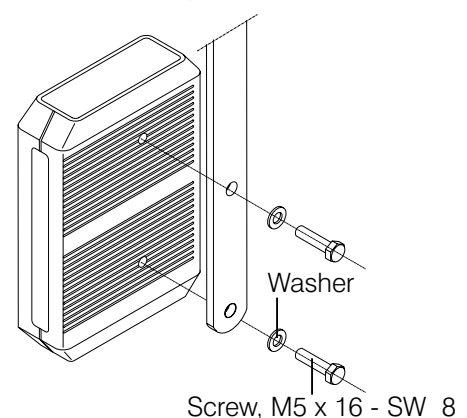
Remove Lighting and Lighting/Adjustment Module (CLAM)



Connecting Plan: Lighting Module and Lighting / Adjustment Module (CLAM)



Detail: Fastening of the Module



17.8 Microswitch

Disassembly

- Lift the seat and remove the splash protection. See Chapter 11.7 in this respect.
- Remove the cable of the switch from the lightening module
- Remove the cable of the microswitch from left frame tube of the chassis.
- Fold the rear-light board upwards and detach the microswitch by loosening the fastening screws (SW 7).

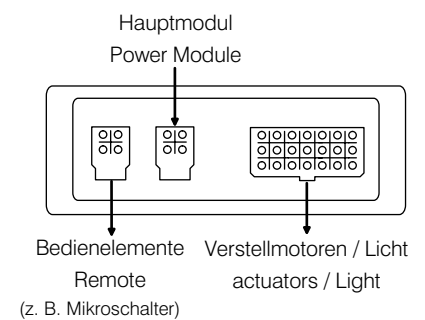
Assembly

- Mount the new switch.
- Lead the cable of the microswitch once again through the left frame tube of the chassis to the 12 V lightening module.
- Insert the BUS plug into the module's socket board. The arrangement of the plugs can be seen on the connecting plan.
- Mount splash protection.
- Fold the rear-light board down again (driving position).

Installing Position of the Microswitch



Connecting Plan of the Microswitch



18.0 Testing Cables and Plugs

Multimeter with Digital Display

18.1 General

All cables and plugs can be examined for defects, such as parted cables, by means of a continuity test. This test is performed with the aid of a multimeter. The way how the correct passage is being signaled (e.g. beeping sound), depends on the kind of multimeter and the settings.

✓ **NOTE:**
For information on the use of the multimeter, please see the respective User's Manual.

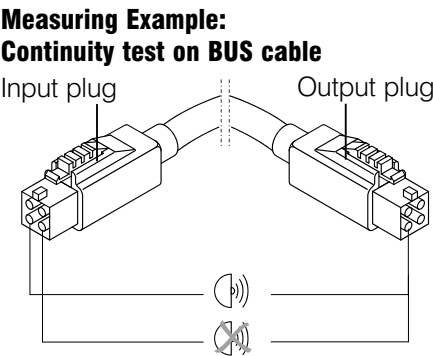


18.2 Testing Procedure

- Set the multimeter to continuity test.
- Loosen all plug connections of the cable to be tested.
- Connect one testing cable of the measuring instrument with a contact at the input plug, and the other cable with the corresponding-contact of the output plug.

✓ **NOTE:**
Input plug and output plug can be determined freely. However, during the measuring, they should not be changed.

- Measure the continuity at the contacts on the cable's input and output plug.
- In the same way, check all connections for short circuit or parted cables.



Malfunction	Cause	Remedy
Passage at varying-contacts or cables?	Short circuit in cable or contact.	Replace cable.
No passage at corresponding contacts / cables?	Parted cable.	Replace cable.

19.0 Wheelchair Programming

19.1 General

For error diagnosis in the ACS electronics and for the setting of standard and custom-made driving profiles, the DYNAMIC Wizard PCD-Software Version 2.0 should be employed.

- **P**rogramming
- **C**onfiguration
- **D**iagnostics

The programme allows to perform diagnoses and settings by means of a commercially available PC starting from series 386 SX under operating systems DOS (from version 3.1 upward) and Windows (from version 3.1 upward) or Windows 95. Also, an independant, non-PC-related programmer can be employed.

The item numbers of the software and of the programmer can be found in chapter 2.0 List of Tools. More detailed information on the PCD-Software and the programmer can be obtained from the INVACARE SERVICE DEPARTMENT. In this respect, please see the service numbers indicated on page 2..

19.2 Programming via PC

- Connect the PC to the programming socket of the joystick box via the programming cable.
- Switch the PC on and start the programme (Dynamic Wizard).
- Switch the wheelchair on via the joystick box.
- The required programme version can be found on the programme version table.
- For the programming of the wheelchair, follow the programming-description (Software Manual).
- Remove the connection cable.
- Switch the wheelchair off and on again.
- Test the driving functions.

Programming Socket and Version Number



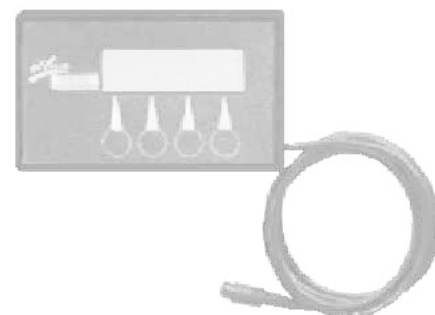
✓ NOTE:

- The version of the programme depends on the type of wheelchair.
- The programme version tables are included in the programme description (Software Manual) or in the description of the programmer.
- The software-version number is indicated on a sticker located on the joystick box.
- By means of the programming software, also driving profiles that are individually tailored to the user's needs can be programmed..

19.2 Programming by Means of the Programming Device

- Connect the transmission cable of the programming device to the programming socket of the joystick box.
- Switch the wheelchair on.
- Select the programming parameters that you want to change and proceed to programme the wheelchair. For this purpose, follow the description of the programming device.
- Remove the transmission cable.
- Switch the joystick box off and on again.
- Check the driving functions.

Programmer



CAUTION:

After every change of the programming parameters, check the driving functions by test drives.

20.0 Storing the Wheelchair

Whenever a storage of the wheelchair for a prolonged period of time is required, the following steps should be taken:

- Check tyre pressure and inflate to the nominal value, if necessary. See chapter 11.0 in this respect.
- Charge battery for 36 hours by means of the INVACARE charger. See chapter 12.0 in this respect.
- Detach the batteries. See chapter 10.1 in this respect.
- Store batteries in a cool place (remove and store separately, if necessary). See chapter 12.0 in this respect.

Before a renewed operation, check tyre pressure and battery voltage once more and inflate / recharge, if required.

F	POIRIER Groupe INVACARE Les Roches F-37230 Fondettes France ☎ (Service Après-Vente): 33 - (0) 2 47 - 62 64 15 Fax (Service Après-Vente): 33 - (0) 2 47 - 62 64 64	NL	INVACARE NEDERLAND Fokkerstraat 36 3905 KV Veenendaal The Netherlands ☎ : 31 - (0) 318 - 550 056 Fax: 31 - (0) 318 - 555 054
D	INVACARE Deutschland GmbH Dehmer Str. 66 D-32549 Bad Oeynhausen Deutschland ☎ (Kundendienst): 49 - (0) 5731 - 754 210 Fax (Kundendienst): 49 - (0) 5731 - 754 216	E	REHADAP SA c/ Areny, s/n Poligon Industrial de Celrà 17460 Celrà (Girona) ESPAÑA ☎ : 34 - (0) 972 - 49 32 00 Fax: 34 - (0) 972 - 49 32 20
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